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August, 1938

Volume 112 *No. 8*

MATERIAL

is only part of the cost

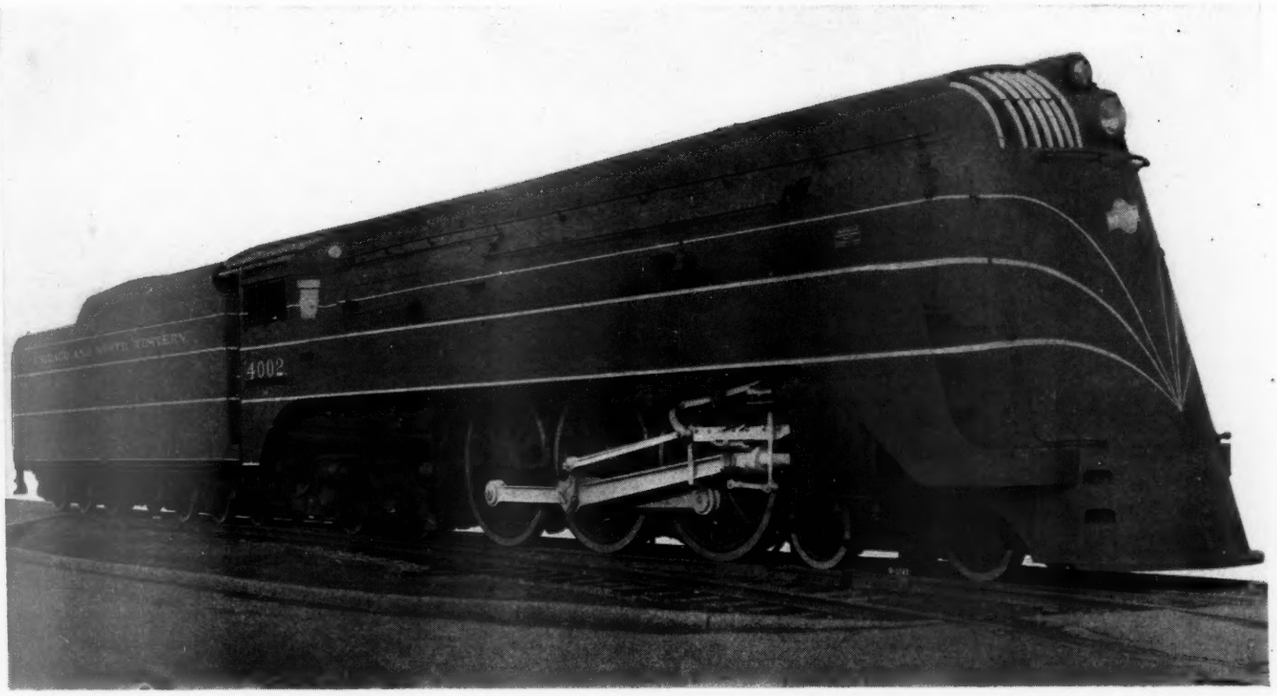
Two pieces of steel, one Republic Alloy Steel and one ordinary steel, when forged and turned into axles look identical—it might be impossible to tell them apart. » » » They both cost the same for labor of forming—Republic costs just a few cents more for material. » » » But the Republic Alloy Steel axle has higher strength and toughness and greater fatigue resistance that gives it longer life, greater resistance to wear and correspondingly lower maintenance costs. » » » Republic Alloy Steel used for crankpins, rods, axles, engine bolts and other highly stressed parts safeguards locomotive performance, minimizes idle time for maintenance and insures maximum locomotive earning capacity. » » » In addition Republic makes many other money-saving materials for railroad use, including Toncan* Iron pipe and sheets, Electrunite* boiler tubes and Upson track materials. Address Department RA, Republic Steel Corporation. General offices: Cleveland, Ohio; Alloy Steel Division: Massillon, Ohio. » » » »

*Reg. U. S. Pat. Off.

REPUBLIC STEEL

STEEL AND TUBES, INC.
TRUSCON STEEL COMPANY
UNION DRAWN STEEL DIVISION
NILES STEEL PRODUCTS DIVISION
BERGER MANUFACTURING DIVISION

REPUBLIC STEEL
REG. U. S. PAT. OFF.



Chicago & North Western Installs

Heavy 4-6-4 Locomotives

Streamline passenger power weighs 412,000 lb. and has a tractive force of 55,000 lb. — All wheels equipped with roller bearings

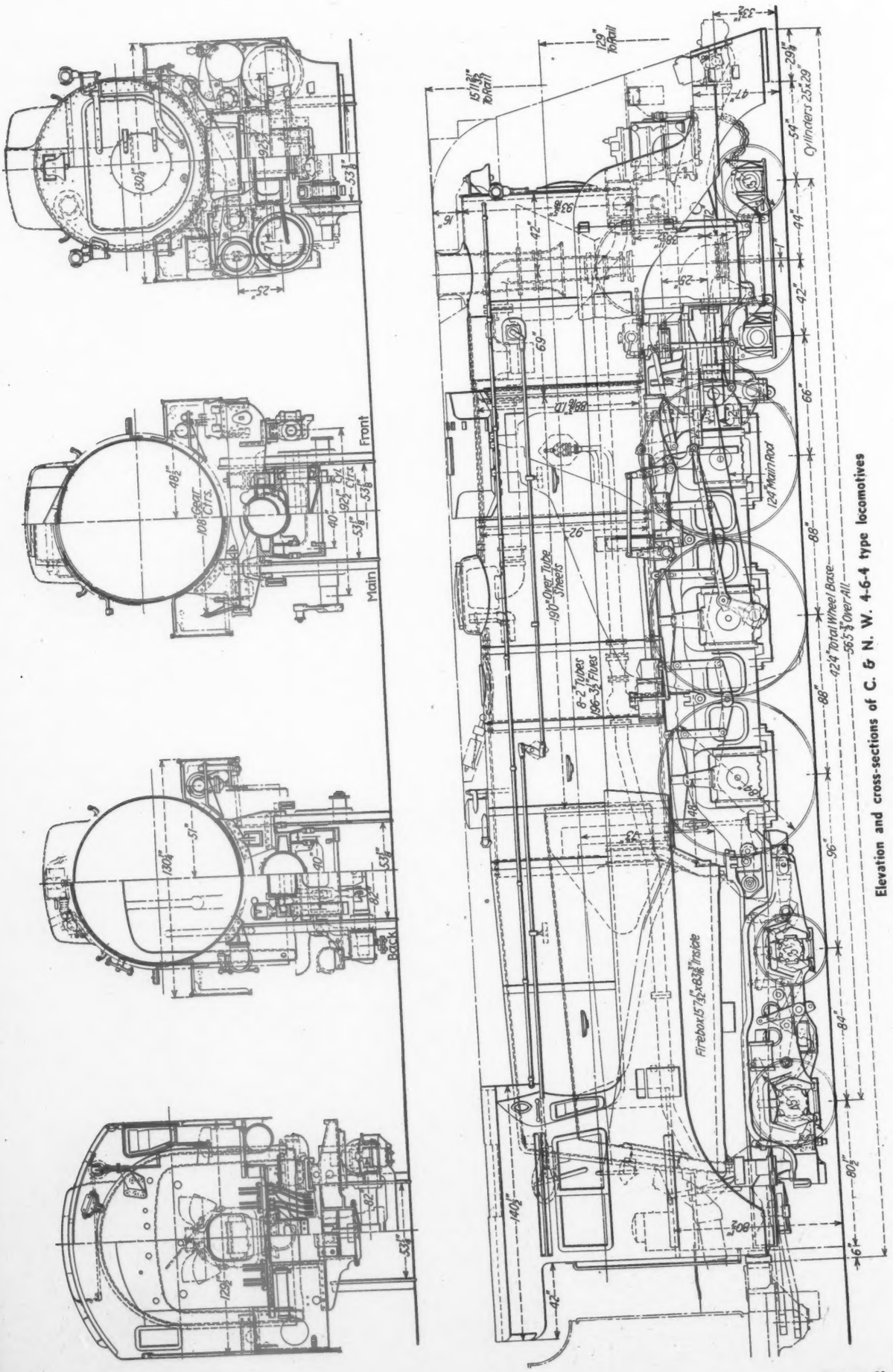
In March and April of this year the American Locomotive Company completed at its Schenectady, N. Y., plant nine streamline 4-6-4 heavy passenger locomotives for service on the Chicago & North Western between Chicago and Omaha, Neb., a distance of 488 miles. These nine locomotives are assigned to the hauling of eight trains, with one locomotive in reserve, and are daily handling from 10 to 17 conventional passenger and Pullman cars on regular runs.

These locomotives are among the largest of the type built to date. They have a weight on drivers of 216,000 lb., a total engine weight of 412,000 lb. and a total engine and tender weight of 772,000 lb. The boilers have a combined evaporative and superheating surface of 5,863 sq. ft. and carry 300 lb. pressure. The tenders are carried on six-wheel trucks and have a coal and water capacity of 25 tons and 20,000 gallons, respectively.

The Boiler

The barrel of the boiler is in three courses, the inside diameter of the first course being $88\frac{3}{16}$ in., the second $90\frac{1}{16}$ in., and the third 92 in. The thickness of the plate of the first course is $\frac{15}{16}$ in., the second $\frac{31}{32}$ in., and the third 1 in. Nickel steel, furnished by the Bethlehem Steel Company, is used for the shell-course plates, welt strips and liners. The dome and safety-valve turret opening is located in the second course. The dome is $40\frac{1}{2}$ in. inside diameter and is flanged from a single piece of plate. The front tube sheet is $\frac{3}{4}$ in. thick and the back tube sheet $\frac{9}{16}$ in. The firebox is $157\frac{1}{32}$ in. long inside and $83\frac{3}{16}$ in. wide inside. The combustion chamber is 31 in. in length. The firebox is arranged for bituminous coal, using pin-hole type, cast-iron rocking grates.

The roof sheet is of nickel steel furnished by Bethlehem, while all the rest of the flanged sheets in the firebox and combustion chamber are of Lukens open-hearth steel. The roof sheet is $\frac{13}{16}$ in. thick, while the outside side sheets are $\frac{9}{16}$ in. thick. All of the inside firebox sheets



Elevation and cross-sections of C. & N. W. 4-6-4 type locomotives

are $^{13}/_{32}$ in. thick. The water space at the mud ring is 5 in. at the sides and rear and 5½ in. at the front.

Welding has been used on the inside throat sheet and back tube sheets. Sealing welds have been used at the back mud-ring corners of the firebox to a height of 10 in. from the bottom of the mud ring. The fire-door

C. & N. W. 4-6-4 Locomotives Compared with Others of the Same Type Recently Built

Road	C. & N. W.	N. Y. C.	A. T. & S. F.	C. B. & Q
Road number	4001	5405	3465	3000
Builder	Alco	Alco	Baldwin	Baldwin
Date built	April, 1938	1937	1937	1930
Tractive force engine, lb.	55,000	43,440	49,300	47,700
Tractive force booster, lb.	....	12,100	....	11,700
Weight engine, lb.	412,000	360,000	412,380	391,880
Weight on drivers, lb.	216,000	196,000	213,440	207,730
Cylinders, diam. and stroke, in.	25 x 29	22½ x 29	23½ x 29½	25 x 28
Driving wheels, diam., in.	84	79	84	78
Steam pressure, lb.	300	275	300	250
Grate area, sq. ft.	90.7	82	98.5	87.9
Heating surface, firebox, sq. ft.	507	360	375	369
Heating surface, total evap., sq. ft.	3,979	4,187	4,770	4,247
Superheat. surface, sq. ft.	1,884	1,745	2,080	1,830
Comb. evap. and superheat., sq. ft.	5,863	5,932	6,850	6,077

opening between the back head and inside back firebox sheet has been welded. Welding has also been employed at each end of all longitudinal seams in the shell of the boiler for a distance of 12 in. from the end of the seam. An extensive application of Alco telltale type flexible stays has been made in the fireboxes of these locomotives. Flexible stays using WZ type sleeves have been

The striping meets in a point at the front end

used in the throat sheet and two outside rows of the back head. Flexible radial stays with WZ sleeves have been used extensively in the firebox sides and crown sheet, except where expansion stays are used in the combustion chamber area.

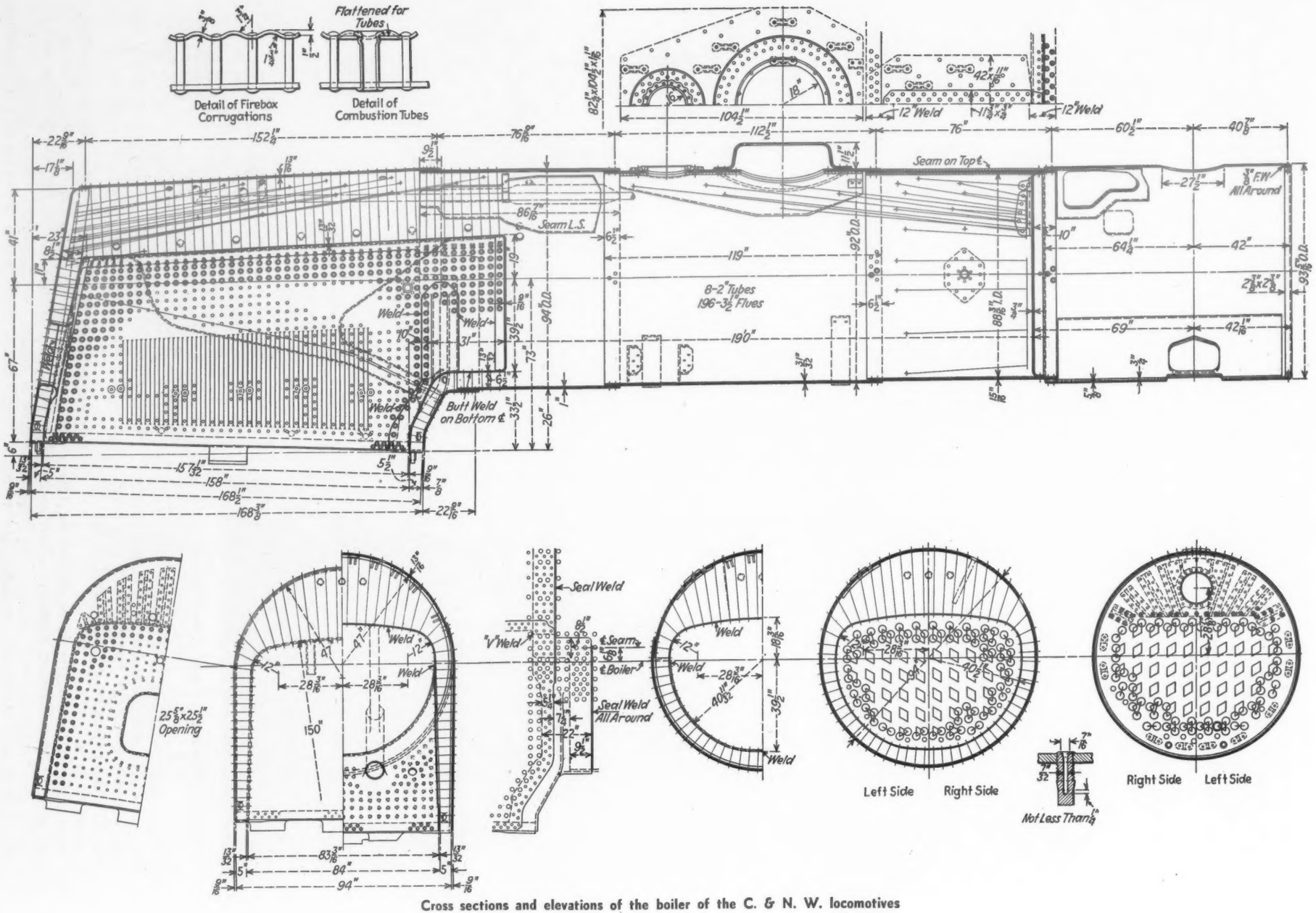
The brick arch in the firebox is supported on two arch tubes and the two Thermic syphons. Four combustion tubes are located in each side of the firebox. The inside firebox side sheets are corrugated between 27 staybolt rows. The corrugations are formed on a radius of 1¾ in. to a total depth from peak to valley of ½ in. Where the combustion tubes pass through the inside firebox the sheet is flattened over a sufficient area to permit beading the tubes. The boilers are equipped with the Barco Type F3a low-water alarm, Superior

General Dimensions, Weights and Proportions of the C. & N. W. 4-6-4 Type Streamline Locomotives

Railroad	C. & N. W.
Builder	American Locomotive Co.
Type of locomotive	4-6-4
Road class	E4
Road numbers	4001-4009
Date built	1938
Service	Passenger
Dimensions:	
Height to top of stack, ft.-in.	15—11$^{11}/_{16}$
Height to center of boiler, ft.-in.	10—9
Width overall, in.	10—9½
Cylinder centers, in.	92½
Weights in working order, lb.:	
On drivers	216,000
On front truck	87,000
On trailing truck	109,000
Total engine	412,000
Tender	360,000
Wheel bases, ft.-in.:	
Driving	14—8
Rigid	14—8
Engine, total	42—4
Engine and tender, total	88—11¾
Wheels, diameter outside tires, in.:	
Driving	84
Front truck	37
Trailing truck:	
Front	37
Rear	45
Engine:	
Cylinders, number, diameter and stroke, in.	2—25 x 29
Valve gear type	Baker
Valves, piston type, size, in.	(7)—12
	(2)—14
Maximum travel, in.	7¾
Steam lap, in.	1⅞
Exhaust clearance, in.	⅛
Lead in full gear, in.	$^{3}/_{16}$
Cut-off in full gear, per cent	72.6
Boiler:	
Type	Straight top and bottom
Steam pressure, lb. per sq. in.	300
Diameter, first ring, inside, in.	88$^{3}/_{8}$
Diameter, largest, outside, in.	94
Firebox length, in.	157$^{1}/_{16}$
Firebox width, in.	83$^{3}/_{8}$
Height mud ring to crown sheet, back, in.	78
Height mud ring to crown sheet, front, in.	92
Combustion chamber length, in.	31
Arch tubes, number and diam., in.	2—3½
Thermic syphons, number	2
Tubes, number and diam., in.	8—2
Flues, number and diam., in.	196—3½
Length over tube sheets, ft.-in.	19—0
Fuel	Bituminous coal
Stoker	Standard BK
Grate	Rocking type
Grate area, sq. ft.	90.7
Heating surfaces, sq. ft.:	
Firebox	367
Arch tubes	21
Thermic syphons	119
Firebox, total	507
Tubes and flues	3,472
Evaporative, total	3,979
Superheating	1,884
Combined evap. and superheat.	5,863
Tender:	
Type	Rectangular
Water capacity, gal.	22,000
Fuel capacity, tons	25
Trucks	6-wheel
Rated tractive force, engine, 85 per cent. lb.	55,000
Weight proportions:	
Weight on drivers ÷ weight engine, per cent	52.5
Weight on drivers ÷ tractive force	3.93
Weight of engine ÷ evaporation	105.5
Weight of engine ÷ comb. heat. surface	7.03
Boiler proportions:	
Firebox heat. surface, per cent comb. heat. surface	86.7
Tube-flue heat. surface, per cent comb. heat. surface	59.25
Superheat. surface, per cent comb. heat. surface	32.15
Firebox heat. surface ÷ grate area	5.6
Tube-flue heat. surface ÷ grate area	38.3
Superheat. surface ÷ grate area	20.78
Comb. heat. surface ÷ grate area	64.70
Evaporation ÷ grate area	4.42
Tractive force ÷ grate area	607.0
Tractive force ÷ evaporation	13.75
Tractive force ÷ comb. heat. surface	9.39
Tractive force x diam. drivers ÷ comb. heat. surface	788.0

flue blowers and Wilson blow-off cocks and mufflers. The fire door is the Franklin Butterfly type. Fuel is fed by means of a Standard type BK stoker. The stoker engine is located on the tender.

Water is fed to the boilers by means of a 6,500-gallon



Cross sections and elevations of the boiler of the C. & N. W. locomotives

Hancock non-lifting injector on the right side and an Elesco No. 3 exhaust-steam injector on the right side. The saturated steam passes through a Tangential steam dryer in the dome to the Type E superheater and is controlled by an American multiple throttle built into the superheater header.

The ash pans are of steel plate, welded at the joints.

Engine Bed and Running Gear

These locomotives are equipped with the General Steel Castings cast engine bed with cylinders, back cylinder heads, link-support and guide-yoke brackets and air-pump brackets cast integral. The boilers are supported on expansion shoes at all four corners of the firebox. A waist-sheet crosstie is located at the reverse-shaft support and between the second and third pairs of drivers.

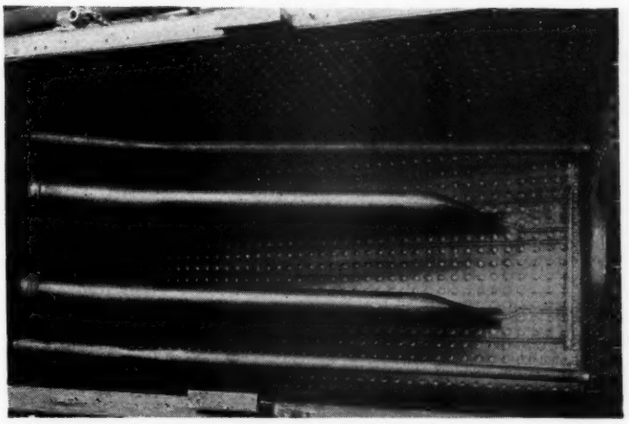
The engine trucks are the General Steel Castings four-wheel type with 37-in. rolled-steel Bethlehem wheels and A. S. F. roller-bearing units. The driving wheel centers are 76 in. in diameter and are the Boxpok type. The driving axles are equipped with Timken roller bearings with one-piece housings. The journal diameter is 13.008 in. at the main wheel and 12.008 in. on the front and back drivers. The diameter of the drivers over the tires is 84 in.

The trailing truck is the four-wheel Delta type furnished by the General Steel Castings Corporation, with 37-in. rolled-steel wheels on the front axle and 45-in. rolled-steel wheels on the rear axle. The wheels were furnished by Bethlehem and the journals are mounted in Timken roller bearings. The diameter of the front trailing-truck journal is 6.254 in. and that of the rear axle 7.004 in. Provision is made in the design of the trailer truck for the future application of a booster.

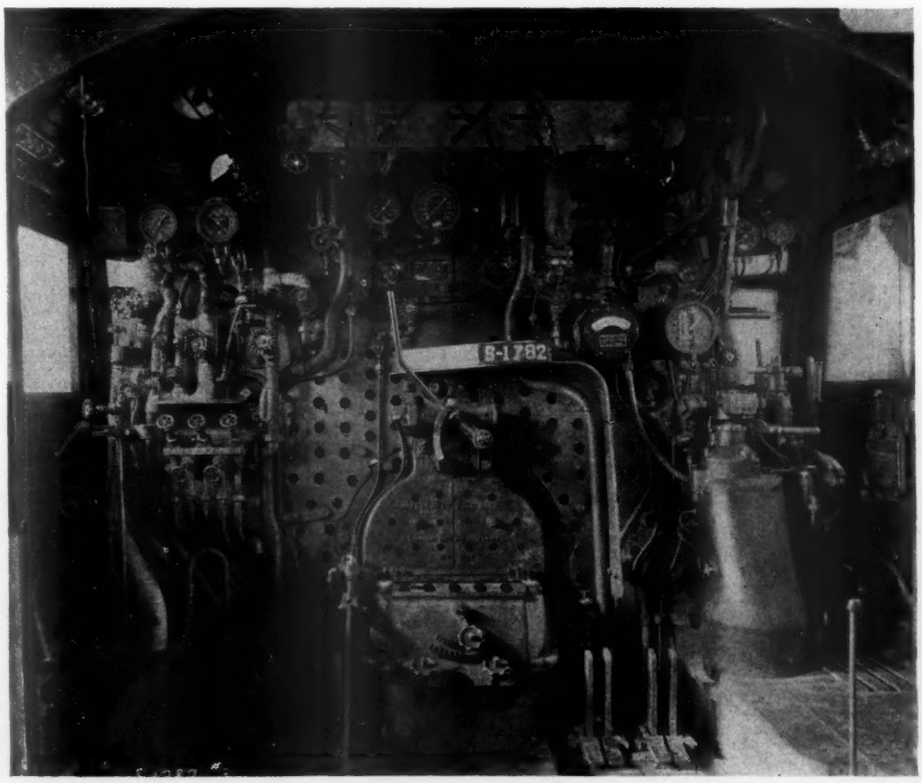
The cylinders are 25 in. by 29 in. and the piston valves on seven of the engines are 12 in. diameter, while the remaining two have 14-in. valves. Cylinders and valve chambers are fitted with Hunt-Spiller gun-iron bushings, piston and valve bull rings and Hunt-Spiller Duplex piston- and valve-packing rings. The piston heads are the Z type, of rolled steel, and the rods are nickel-carbon steel 5 in. in diameter. The multiple-bearing type of crosshead is used. The main and side rods are nickel-carbon steel, normalized, quenched and drawn. Floating type bushings are used both in the main and side rods.

The weight of the reciprocating parts on each side of these locomotives is 1,720 lb. The amount of overbalance at each wheel is 201 lb. and the dynamic augment is 4,910 lb., 8,750 lb. and 13,660 lb. at 60, 80 and 100 m. p. h., respectively. The revolving weights are cross counterbalanced in all wheels.

Steam distribution is controlled by Baker valve gear actuated by a Barco type M-1 power reverse gear mounted on a bracket secured to the boiler shell.



The interior of the firebox



Arrangement of cab and back head

Cross sections and elevations of the boiler of the C. & N. W. locomotives

Force-feed lubrication is used on cylinders, valves, guides, valve-rod guides, engine-truck, driving-box and trailer-truck-box shoes, engine-truck center pin and trailer-truck fulcrum. Two Detroit 32-pint lubricators, one of 10 feeds and the other of 16 feeds, are applied on the right and left sides, respectively. Both are driven from the top end of a combination lever. A Nathan six-pint, four-feed hydrostatic lubricator takes care of the air pumps and stoker engine.

The brakes are the Westinghouse Schedule 8-ET. Two 8½-in. cross-compound compressors are mounted on a bracket cast integral with the bed back of the bumper beam. Air reservoirs of 60,000 cu. in. capacity are cast in the bed. Independent brake cylinders are used for driving and trailer brakes. The entire engine brake rigging, as well as the spring rigging, is fitted with Ex-Cell-O pins and bushings.

Piping

An interesting feature of the locomotives is the arrangement of the saturated-steam piping designed to eliminate the cab turret. Just ahead of the front of the cab there are three main steam valves connected to three dry pipes, inside the boiler, from the dome. Two of these are 2½-in. Hancock angle valves, one for the right injector and the other for the exhaust-steam injector on the left side. A third 2½-in. Hancock angle valve feeds into a 2½-in. manifold at the end of which is the steam-heat shut-off valve and pressure regulator. From the manifold itself there are two outlets, one a ¾-in. pipe to the cylinder cocks and the other a 1-in. nipple to a 1-in. by ¾-in. by ½-in. tee in another manifold made up of pipe and fittings. This has four outlets,—two ½-in. connections to the injector and lubricator heaters and two at the opposite end of ¾-in. size to the coal sprinkler and headlight generator. The superheated-steam line to the blowers, air pumps, whistle, coal pusher and smoke consumer, is arranged in the conventional manner with the take-off from the superheater header.

Streamlining

These locomotives are covered with a shroud which was designed to provide a pleasing appearance while, at the same time, offering the least interference with inspection and maintenance. No. 14-gage material has been used on the front end and sides and No. 16 gage on the top cowling. Three red stripes run along the sides of the entire engine and tender, matching similar stripes on the cars, and converge at a point just above the coupler opening.

Except at the rear of the cab and at the front steps over the cylinders, there is no skirt below the tops of the drivers. Motion work parts and the lower part of the firebox and ash pan are exposed for inspection. The front is hinged to provide ready access to smokebox and air pumps. The shrouding at the front of the locomotive is set back of a vertical line through the coupler pulling faces to permit two of these locomotives to be coupled head on.

The Tender

The tender is built up on a Commonwealth cast-steel water-bottom frame with electrically welded steel-plate tank. The tank is 40 ft. long, 10 ft. 6 in. wide and 87 in. deep. The tender-truck wheel base is 11 ft. and the total tender wheel base is 34 ft. 11½ in. The tender trucks are General Steel Castings six-wheel non-swing motion, center-bearing trucks, with cast-steel side frames, Davis cast-steel wheels and Simplex unit cylinder clasp brakes having two brake cylinders per truck. A. S. F. roller-bearing units are used on the tender wheels in combination with outside journal boxes. The tender draft gear is the Miner ASXB with A. S. F. cast-steel yoke and Type E coupler. The Franklin Unit Safety bar is used between engine and tender.

Partial List of Materials and Equipment on the C. & N. W. 4-6-4 Type Streamline Locomotives

Engine bed; engine and trailer trucks	General Steel Castings Corp., Eddystone, Pa.
Engine and trailer-truck wheels	Bethlehem Steel Co., Bethlehem, Pa.
Tires, driving-wheel and others	American Locomotive Co., New York
Driving boxes, roller-bearing	The Timken Roller Bearing Company, Canton, Ohio
Slidguide attachment	American Locomotive Co., New York
Coupler yoke	American Steel Foundries, Chicago
Front coupler	National Malleable and Steel Castings Co., Cleveland, Ohio
Air brake and air signal	Westinghouse Air Brake Co., Wilmerding, Pa.
Driver brake	American Brake Co., St. Louis, Mo.
Brake shoes	American Brake Shoe & Foundry Co., New York
Drawbar, engine and tender	Franklin Railway Supply Co., Inc., New York
Train control	General Railway Signal Co., Rochester, N. Y.
Radial buffer	Franklin Railway Supply Co., Inc., New York
Springs, driving	American Steel Foundries, Chicago
Pins and bushings	Ex-Cell-O Corporation, Detroit, Mich.
Cylinder and piston-valve bushings; piston and valve bull rings; duplex sectional cylinder- and valve-packing rings	Hunt-Spiller Manufacturing Corporation, Boston, Mass.
Cylinder cocks	The Prime Manufacturing Co., Milwaukee, Wis.
Valve gear	Pilliod Co., New York
Piston-rod packing	Paxton-Mitchell Co., Omaha, Neb.
Rod brasses	Magnus Metal Div., National Lead Co., New York
Rod fittings	Alemite Div. Stewart-Warner Corp., Chicago
Roller bearings:	
Engine truck	American Steel Foundries, Chicago
Driving and trailer truck	The Timken Roller Bearing Co., Canton, Ohio
Power reverse gear	Barco Manufacturing Co., Chicago
Lubricators:	
Hydrostatic	Nathan Manufacturing Co., New York
Mechanical	Detroit Lubricator Co., Detroit, Mich.
Boiler steel	Bethlehem Steel Co., Bethlehem, Pa. Lukens Steel Co., Coatesville, Pa.
Tubes and flues	Globe Steel Tubes Co., Milwaukee, Wis.
Staybolt iron	Joseph T. Ryerson & Son, Inc., Chicago
Staybolts	American Locomotive Co., New York
Firebox rivets	The Champion Rivet Co., Cleveland, Ohio
Thermic syphon	Locomotive Firebox Co., Chicago
Brick arch	American Arch Co., Inc., New York
Superheater	The Superheater Company, New York
Throttle valve	American Throttle Co., New York
Throttle-rod stuffing-box packing	The Allpax Co., Inc., Mamaroneck, N. Y.
Tangential steam dryer	The Superheater Company, New York
Blow-off cock and muffler	Wilson Engineering Corp., Chicago
Blower valve; steam and air gages; safety valves; back-pressure gages; check valves	Locomotive Equipment Division of Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
Lagging	Johns-Manville Sales Corp., New York
Pipe covering	Union Asbestos & Rubber Co., Chicago
Live steam injector	Locomotive Equipment Division of Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
Exhaust steam injector	The Superheater Company, New York
Washout plugs	Huron Mfg. Co., Detroit, Mich.
Stoker	Standard Stoker Co., Inc., New York
Fire door	Franklin Railway Supply Co., Inc., New York
Flue blower	Superior Railway Products Corp., Pittsburgh, Pa.
Grates	American Locomotive Co., New York
Coal sprinker	Wm. Sellers & Co., Inc., Philadelphia, Pa.
Gage holder	Swanson Co., Chicago
Pyrometer	The Superheater Company, New York
Low water alarm	Barco Manufacturing Co., Chicago
Water columns	Sargent Co., Chicago
Steam heating equipment	Vapor Car Heating Co., Inc., Chicago
Steam-heat connections	Barco Manufacturing Co., Chicago
Whistle	Locomotive Equipment Division of Manning, Maxwell & Moore, Inc., Bridgeport, Conn.
Bell ringer	Railway Service and Supply Corp., Indianapolis, Ind.
Sander	Graham-White Sander Corp., Roanoke, Va.
Headlight and generator	Pyle-National Co., Chicago
Lamps	The Adams & Westlake Co., Elkhart, Ind.
Flexible connections between engine and tender	Barco Manufacturing Co., Chicago
Cab windows	The Prime Manufacturing Co., Milwaukee, Wis.
Tender:	
Water-bottom frame; trucks	General Steel Castings Corp., Eddystone, Pa.
Wheels; springs	American Steel Foundries, Chicago
Bushings	Ex-Cell-O Corporation, Detroit, Mich.
Journal boxes	National Malleable and Steel Castings Co,. Cleveland, Ohio
Journal bearings	American Steel Foundries, Chicago
Clasp brake	American Steel Foundries, Chicago
Dust guards	Geo. O. Jenkins Co., Bridgewater, Mass.
Draft gear	W. H. Miner, Inc., Chicago
Tank	Bethlehem Steel Co., Bethlehem, Pa.
Tank valve	Crane Co., Chicago
Hose	United States Rubber Products, Inc., Passaic, N. J.

Service Failures

By Fred H. Williams
M. Sc., F. R. S. A.

SOME attention was given in the article in the May, 1938, *Railway Mechanical Engineer* to breakages of small crank shafts on hand cars which had been modernized by the application of a gasoline motor drive. Such failures, while they may prove embarrassing, ordinarily do not involve any great amount of expense. Unfortunately, however, similar failures do occur with crank shafts of larger size on Diesel engines which involve considerable sums of money.

An illustration of such a failure is shown in Fig. 1. A fatigue crack started in a rough fillet, the finish of which is made more clear by Figs. 2 and 3, the latter being an enlarged view of the fillet at the point where the fatigue crack started. Shafts of this type cost several thousand dollars apiece and obviously every precaution should be taken to insure a smooth finish in the fillets. The roughness of the finish on the crank-pin arm and in the two fillets is quite clearly shown in Fig. 2. Certainly it does not look well for a high-grade piece of machinery of this sort to wear a coat like a tramp, and yet examples of this kind are encountered only too frequently. It is true that in this case the fillet at the bearing was generously proportioned and fairly well finished, but the fillet about 7/8 in. above the bearing was very rough and of much the same type as that of the broken hand car crank shaft, which was illustrated in the May issue, page 175.

Incidentally, the working drawing called for an "ff" finish and the manufacturer maintained that such a finish had been furnished. It was also inferred that while the railways demand good finishes, they do not make them themselves. This may be true in some instances, and yet such failures drive home the fact that unusual precautions must be taken to insure smooth and high-grade finishes on all important parts. Polished surfaces are essential to the elimination of such failures; rough and torn surfaces are breeders of fatigue cracks and failures.

It can, of course, be argued that with the best of finishes stress-corrosion cracks, such as were discussed in the earlier articles of this series, could occur, and it is quite true that frequently it is impossible to differentiate between stress-corrosion cracks and those caused by tool or score marks. That, however, is no reason why inferior workmanship should be tolerated under any condition. In the case of the crank shaft under consideration there is no question but what the failure was due to rough machining and that stress-corrosion cracks were not present.

While we are considering Diesel-engine crank-shaft failures, it may be well to illustrate a typical case of another sort. In these days of high speed, special efforts are being made to reduce the weight of rotating parts and particularly those of odd shapes. The crank shaft of a six-cylinder Diesel engine is shown in Fig. 4. The crank pins are lightened by drilling a hole about 2½ in.

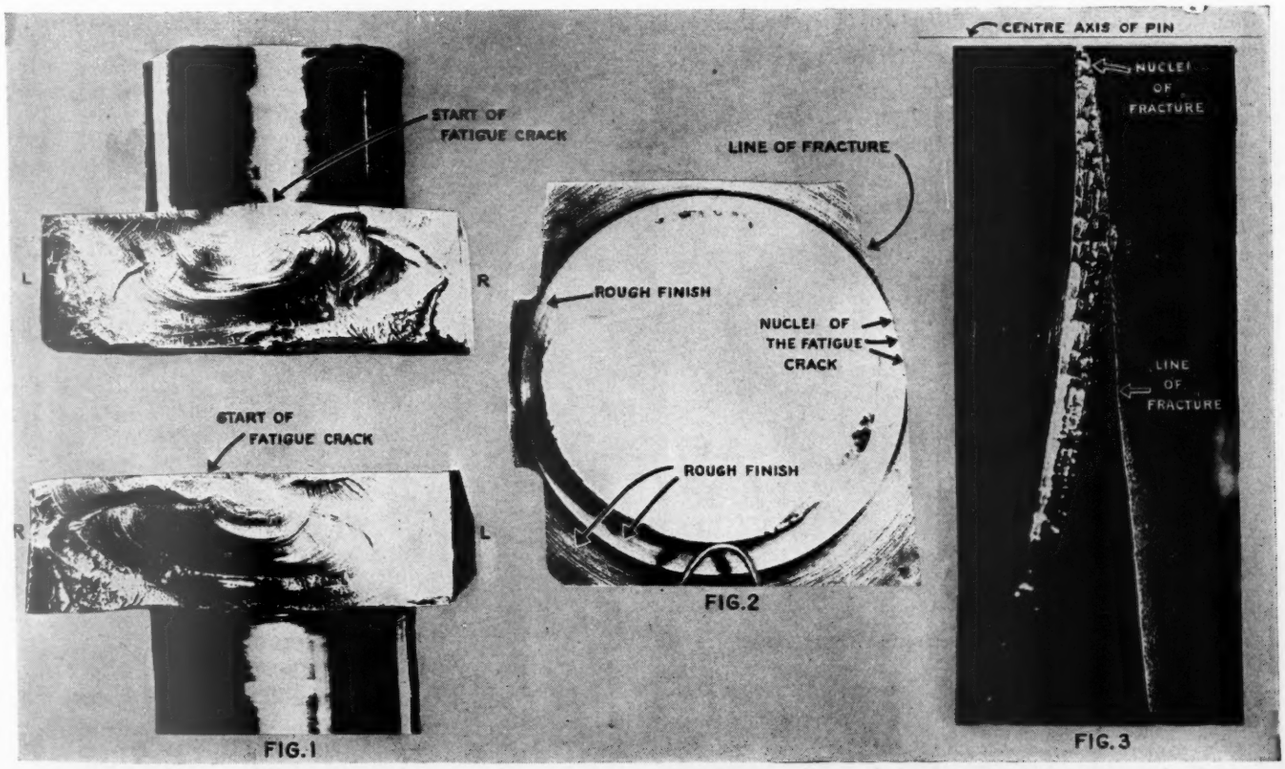


Fig. 1: Fractured faces of broken Diesel engine crank shaft.—Fig. 2: Section through crank pin of large crank shaft.—The fillets at the juncture of the crank pin and crank arm and a short distance away on the crank arm are both rough finished.—Fig. 3: Enlarged view of fillet in which fatigue crack started—designated as "ff" finish by manufacturer of crank shaft

in diameter through each one. Unfortunately, these holes were left in a rough condition and here the trouble started.

Figs. 5 and 6 illustrate a break that started from a crack in the drilled hole through a pin. A secondary fatigue crack is plainly evident in Fig. 6. That it was a fatigue crack is indicated by the fact that its progress is plainly marked, with the typical progressing circular lines. This secondary crack started from a spot in the primary crack, caused either from an inclusion or by a local stress which was set up when the primary crack had progressed beyond its effective range. The secondary crack is an unusually good example of a fatigue crack and indicates how design goes for naught when the machine shop falls down on its job, either by carelessness or by speed in rushing the work through, or a lack of appreciation of the essentials of good finishes and proper fillets and radii.

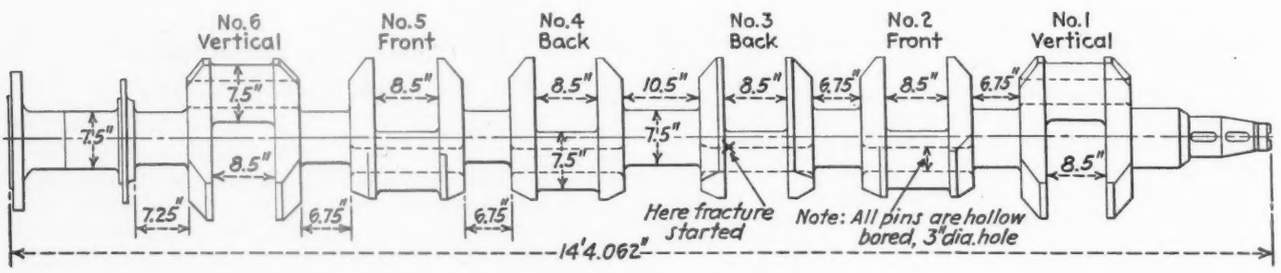


Fig. 4—Six-cylinder Diesel engine crank shaft

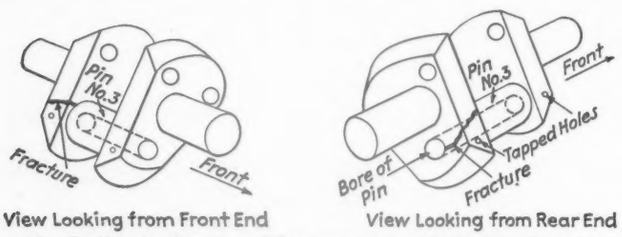


Fig. 5—Showing location of fracture on six-cylinder Diesel engine crank shaft

Another view of the fracture, including a portion of the drilled hole, is shown in Fig. 7. While the surface of the drilled hole is slightly out of focus, it can readily be seen that the finish was rough and crude. This is indicated still more clearly in Fig. 8—another view of the break. It is evident from Fig. 7 that the starting point of the crack was from the bore and not from the surface of the arm. In Fig. 8, the primary crack is shown below the drilled hole and while the finish of this section is a bit indistinct in the photograph, it is quite evident that the fatigue crack started from the bore and radiated outward.

The grave danger of drilling through steel is that the drill may not cut properly and will tear the steel, leaving stressed metal when the hole is finished. The number of failures from drilled holes is very large and such failures will continue as long as precautions are not taken to smooth the drilled walls and relieve any stresses caused

(*Continued on page 296*)

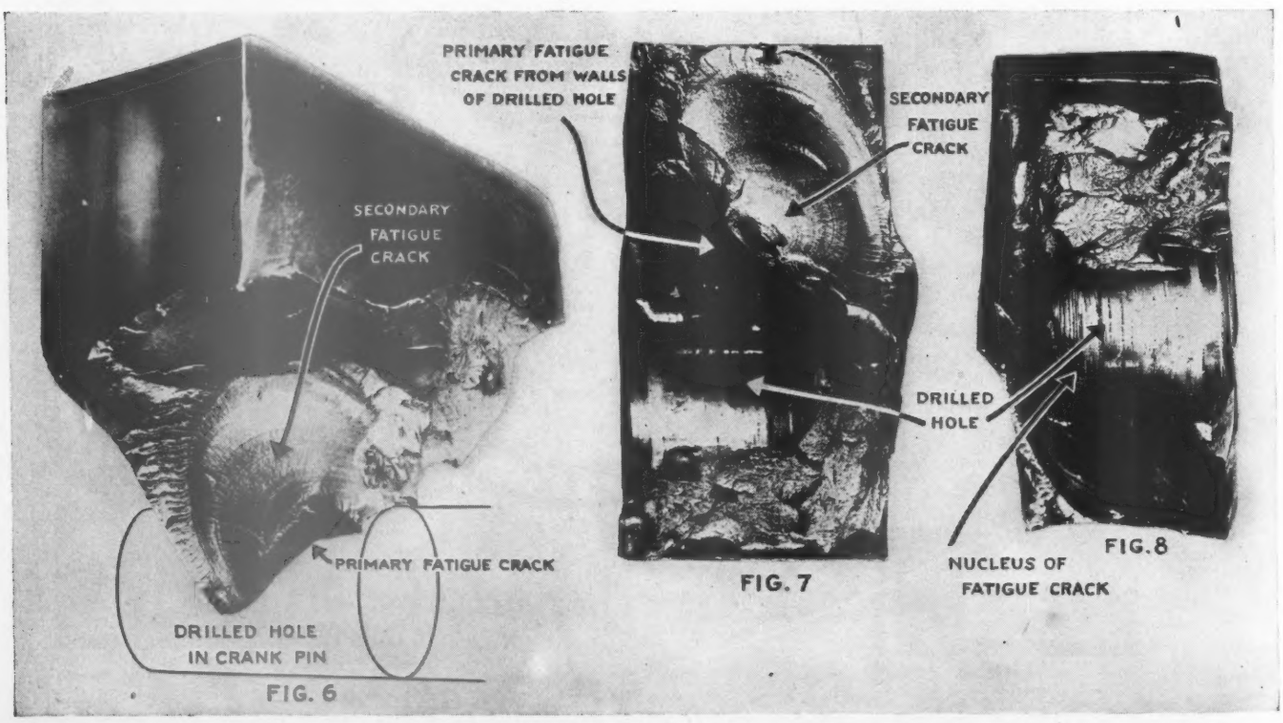
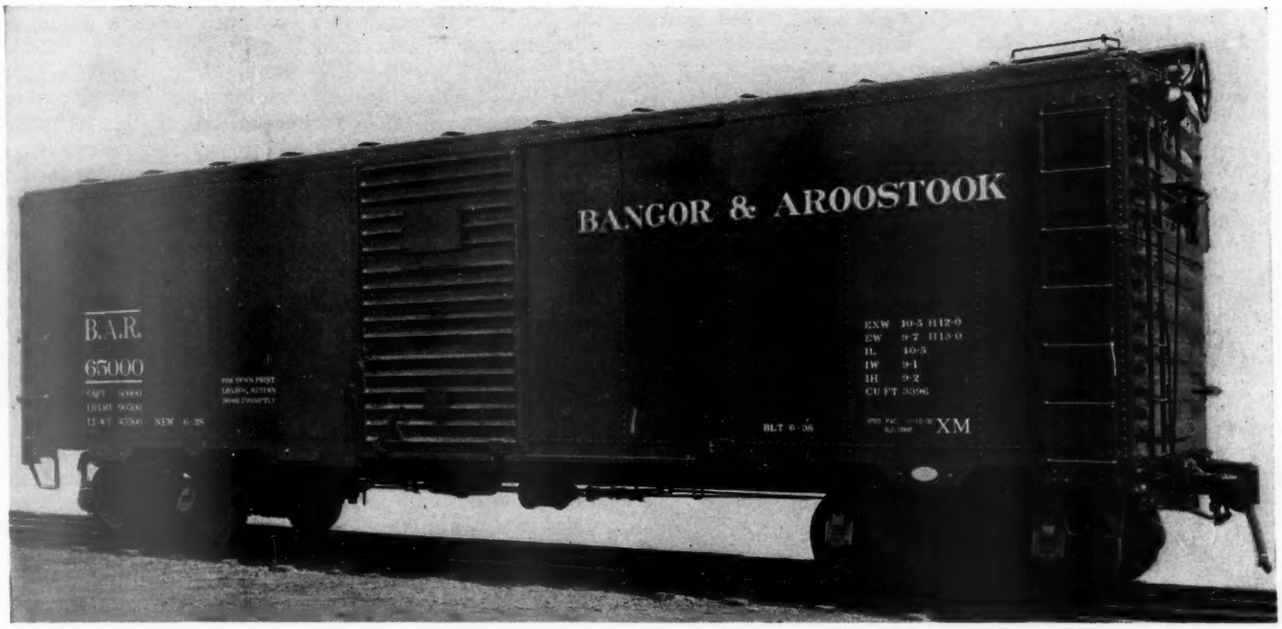


Fig. 6: Portion of fracture of Diesel engine crank shaft showing primary and secondary fatigue cracks.—Figs. 7 and 8: Walls of drilled hole are torn and scored; this caused the failure of the crank shaft



B. A. R. 40-ton steel-sheathed box cars built by the Magor Car Corporation

Special Features for Handling Newsprint Lading Incorporated in

Bangor & Aroostook Box Cars

Magor Car Corporation delivers 500 box cars to the B. A. R. that follow A. A. R. design but have heavy lining, flooring and anchoring features to protect newsprint lading while in transit

THE Bangor & Aroostook recently received from the Magor Car Corporation, New York, 500 steel-sheathed wood-lined 40-ton capacity box cars in the building of which special consideration was given to features which permit handling newsprint lading without damage. Newsprint is shipped in rolls in two sizes; namely, 36 in. in diameter by 68 in. high, weighing between 1,700 and 2,000 lb., and half rolls 29 in. in diameter by 34 in. high, weighing between 850 and 1,000 lb. This commodity requires the utmost care while being handled in transit; damage due to chafing of rolls, shifting of loaded rolls within the car while in transit, and water damage are only a few of the many causes which render it unsuitable for use.

These 40-ton capacity cars have a cubical capacity of 3,396 cu. ft., a light weight of 45,500 lb., a load limit of 90,500 lb., and a ratio of pay load to gross load of 66.5 per cent. The principal proportions of the cars are given in the accompanying table.

Features of Superstructure and Lining

The car superstructure follows A. A. R. recommended practices. The roof, of Chicago-Hutchins type, is of solid galvanized steel and has compression riveted seams. The doors, furnished by the Youngstown Steel Door Company, are fitted with Camel roller lift fixtures. The ends are of Dreadnaught corrugated two-piece type with 3/16-in. top and 1/4-in. bottom sections. Copper-bearing steel is used in the ends, doors, roof and the side sheathing. To insure against water leakage, a generous amount of welding is employed throughout.

The floor consists of a course of 2 3/8-in. tongue-and-grooved yellow pine extending crosswise of the car, bolted in place with MacLean-Fogg water-tight bolts and No. 2 speed nuts. On top of the 2 3/8-in. sub-floor is applied a top floor consisting of 7/8-in. kiln-dried spruce lumber running lengthwise of the car and nailed to the sub-floor with cement-coated oval-head barbed car nails. The top spruce floor is applied to assist in the handling of the paper rolls by means of lift trucks and to form a uniformly level floor for the loading.

The side lining is of 1 1/16-in. tongue-and-grooved southern yellow pine. It is blind nailed horizontally to four corner and four intermediate side nailing posts. The end lining is of 1 5/16-in. tongue-and-grooved southern

Principal Proportions of the B. A. R. 40-Ton Box Cars

Length inside of body, ft. and in.	40- 5
Width inside of body, ft. and in.	9- 1½
Height from floor to roof at inside width, ft. and in.	9- 2½
Width of side-door opening, ft. and in.	6- 0
Height of side-door opening, ft. and in.	8- 7⅜
Length over striking plates, ft. and in.	41- 8½
Length center to center of trucks, ft. and in.	30- 8½
Width of car over side sills, ft. and in.	9- 9¾
Width over side plates, ft. and in.	9-10⅜
Cubical capacity, cu. ft.	3,396
Weight capacity, lb.	80,000
Load limit, lb.	90,500
Light weight, lb.	45,500
Ratio of pay load to gross load, per cent	66.5

yellow pine extending vertically and blind nailed to five nailing strips in each end. Blind nailing is used throughout to prevent damage to the paper rolls when coming in contact with exposed nail heads which commonly work out in service.

Steel binding anchors are used in each corner of the car welded to the ends and side posts 53½ in. above the floor level to permit of the use of steel straps which encircle the rolls of paper to secure them in each end of the car thus preventing shifting in transit or yard switching.

The Underframe and Trucks

The center sills of the cars are formed of two 36.21 lb. U. S. S. rolled Z-sections, the top flanges of which

The ends, doors, roof and side sheathing of the B. A. R. cars are of copper-bearing steel

are joined by welding. The side sills are of 6 in. by 3½ in. by 5/16 in. rolled steel angles, extending the full length of the car and reinforced at the bolsters by 6 in., 15.3 lb. ship channels and over the door opening by 6 in., 10.7 bulb angles.

The bolsters are of the built-up type with ¼-in. pressed plate diaphragms and 21-in. by 7/16-in. top and bottom cover plates. Stucki roller-type side bearings are riveted to the truck bolsters. Drop-forged steel body center plates are used.

There are two sets of crossbearers and four sets of crossties used in the underframe. Diagonal braces, pressed from ¼-in. plate, extend from each corner of the car from the junction of side and end sills into the junction of the bolsters and center sills. The end sills are of 6-in. by 3½-in. by 5/16-in. angles, extending crosswise of the car over the center sills. The floor stringers are of 3-in., 6.7-lb. Z-bars extending between the bolsters and crossbearers over the crossties and between the crossbearers at the center of the car; there is one set at each side of the car about midway between the side and center sills, punched to take floor bolts.

The trucks, furnished by the Gould Coupler Corporation, are of the self-alining spring-plankless 40-ton capacity type which embody integral-box double-truss cast steel side frames with Symington hooded-type malleable-iron journal-box lids. Coil-Elliptic springs are used to dampen harmonic oscillation to prevent chafing of the wrappers surrounding the newsprint lading and damage to the ends of the rolls. A. A. R. No. 3 brake beams with Azee brake-hanger wear plates, loop-type forged-steel brake hangers and Creco four-point brake-beam supports, and Schaefer truck levers of forged steel are used. The 5-in. by 9-in. axles were furnished by the Bethlehem Steel Company and the Carnegie-Illinois Steel Corporation, the 33-in., 700-lb., wheels by the Ramapo Foundry and Wheel Works, the brake beams by the Davis Brake Beam Company, the brake shoes by the American Brake Shoe & Foundry Company and the brake shoe keys by the Buffalo Brake Beam Company.

National Malleable & Steel Castings Company Type E single rotary operating couplers with cast-steel yokes and Miner A-22-XB friction-type one-follower draft gear are used. The coupler operating device is of the Imperial type furnished by the Union Metal Products Company. The AB brake equipment was furnished by Westinghouse. All piping is of extra heavy steel and is welded to the body crossbearers. Transco metal brake steps, Brascott side and end ladders, and Universal hand brakes are used.

The doors and ends are painted a dark shade of green, rather than the usual black or red; the sides are red. As cars primarily in newsprint paper service must at all times be clean and free from grease, odors, acids and similar commodities, each car is stencilled to indicate newsprint service, and it is felt that the distinctive painting will help to distinguish the car and prevent its misuse.

Railway Equipment Service Failures

(*Continued from page 294*)

by tears in the metal. This suggests that special attention should be given to the proper sharpening of drills, a vital factor that is too little appreciated.

It may be advisable to call attention to a rather common application of drilled holes in which difficulties have been experienced. This is the drilling of oil or grease holes in crank shafts. These holes are long and difficult to drill, especially if there is a tendency for the drill to run off. In such instances, when the holes are drilled from both ends they will not line up and I have seen cases where they were 3/16 in. out of line. It is not unusual to find such holes stuffed with waste, in the hope that the inspectors would overlook the defect.

Too frequently in case of fillets, radii and finishes the shop authorities are prone to defend a poor position by saying, "The drawing did not call for it." In return the drafting room may suggest, "It is an important feature of shop practice and therefore not necessary to include it on the drawing."

If it is not advisable to specify these details on every drawing, would it not be possible to establish standard practices as to the radii and fillets, with the understanding that such standard practices are to be followed in all cases? Under such circumstances alibis would not be tolerated and buck passing would be prevented.

Facts Concerning the Buchi System of

Diesel Engine Supercharging*

A discussion of the basic principles of supercharging, how it is accomplished mechanically and the effect on the performance of a Diesel engine

A GREAT deal of misunderstanding exists at the present time, even among the technical men in the Diesel-engine industry, concerning the detailed principles involved in modern supercharging of Diesel engines. This article is intended to clear up some of the basic principles involved in language which can easily be understood.

Basic Principles

Generally, it is believed that supercharging consists merely in forcing more air into the power cylinders at a pressure above atmosphere, and therefore the resulting stresses and increasing pressures are in direct proportion to the increased output. This, however, is far from being correct. As a matter of fact, the primary reason which prompted a study of the possibilities of supercharging is the great loss of volumetric efficiency due to overheating the incoming air both by dilution with the residual gases in the clearance space and also by the heat absorbed from the hot engine parts. This is far more pronounced than is generally suspected even by the most experienced designers.

The effect is self-evident if it is assumed, for example, that the incoming air is heated to a temperature of say, 500 deg. F. Without ramming, the volumetric efficiency would then be only 50 per cent and, therefore, 50 per cent of the engine manufacturing cost is wasted. The above example is made extreme to illustrate the point and for easy mental calculation. Diesel engines generally never reach a volumetric efficiency as low as 50 per cent in the ranges of speed and power usually employed.

From the above, it is easily seen that if this volumetric efficiency is increased to 100 per cent a considerable increase in power can be obtained without the slightest increase in compression pressure, or maximum firing pressure.

At the same time, if the ratio of fuel to air be kept constant, the engine parts will operate considerably cooler because the hot exhaust gases will not be in the cylinder during the suction and compression stroke. Also, the firing and exhaust stroke temperatures will be lower in proportion to the heat removed.

The accomplishment of the above is the primary reason for modern supercharging and accounts for about 30 to 35 per cent of the increased output. Inasmuch as the accomplishment of the above involves a certain amount of machinery, it is only logical to use this equipment for making gains consistent with general reliability of the engine itself. The increased reliability of the engine, due to lower temperatures, permits a further gain of from 15 to 20 per cent making a total overall gain of approximately 50 per cent.

Effect of Supercharging on the Engine Proper

To the average layman, it might appear that the 50 per cent increase in power output would surely result in an increase in engine wear. This, however, is not the case, as a Diesel engine of high compression pressures and inertia of reciprocating and rotating parts, does practically the same amount of friction work at no load as at full load, and even if the output were doubled, the wear on the bearings would not noticeably be increased. The parts which usually wear most, namely, piston rings and cylinder liners, are now better

* From information supplied by the American Locomotive Company.

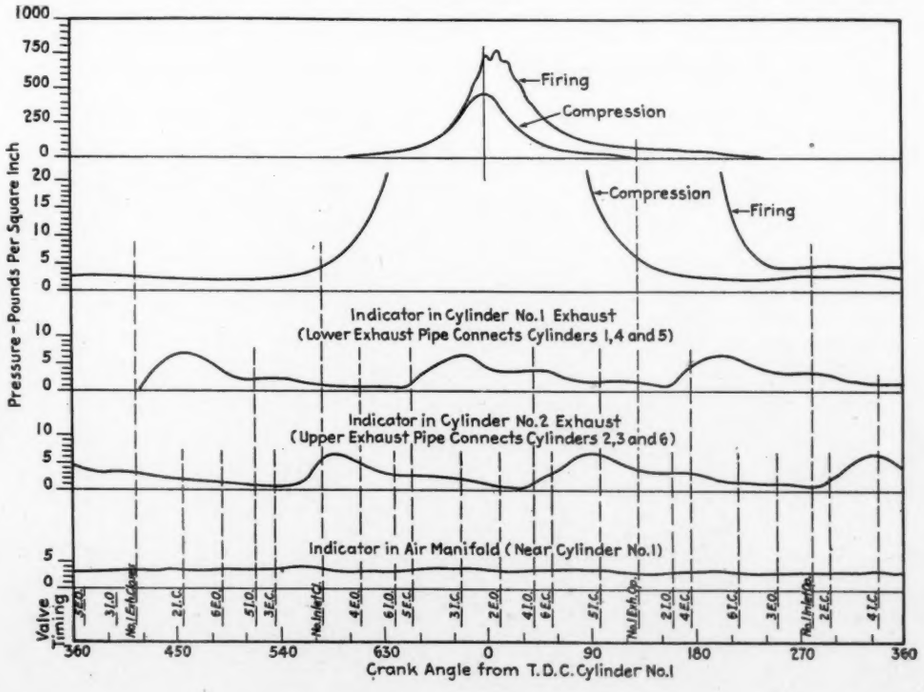


Fig. 1—Group of indicator diagrams showing various operating phases of supercharged 900 hp. engine. The charts, from top to bottom are: (1) maximum compression and firing pressures; (2) enlarged portion of curves to show minimum pressures; (3) and (4) curves, indicator pressures in exhaust manifold through a full cycle range (two engine revolutions) and (5) resultant air pressure in air manifold—this pressure is an average of (3) and (4) combined

cooled thus allowing a better oil film to be maintained so that instead of increased wear, actually less wear may be expected. Also, there would be less tendency of the piston rings to stick.

Methods of Accomplishment

The Buchi supercharging system consists of an exhaust-gas turbine directly connected to a centrifugal compressor. The engine exhaust is piped directly to the exhaust turbine and at full load results in a mean pressure of about two to three pounds per square inch in the exhaust pipes between the engine and the turbine. The energy of expanding this exhaust gas to atmospheric pressure provides the means of driving the blower. The blower creates an air pressure of about three to five pounds per square inch. This air is piped to the engine through an air inlet header.

In order to clean out or scavenge the cylinder of burned gases and cool the engine parts, the inlet and exhaust valves are made to overlap in their opening for a long time at the end of the exhaust stroke, which allows the air to blow from the inlet header through the cylinder into the exhaust header, cleaning out all the exhaust gases from the cylinder and cooling the hot engine parts.

A mean pressure difference of from one to two pounds per square inch exists between the inlet and exhaust pipe. This would not allow a complete scavenging of the cylinder in the small time available. Therefore, in order to assure more effective scavenging, the pressure in the exhaust pipe is made to pulsate so that during the period of scavenging the pressure in the exhaust manifold is very much reduced. This creates a pressure difference between the inlet and exhaust pipe of not one pound but very much more, and results in a violent rush of air through the combustion space from inlet to exhaust manifolds. This pulsation is accomplished by having a multiplicity of exhaust pipes.

A study of the graph in Fig. 1 showing the valve timings, air inlet and exhaust pressures will clearly show the relation of one feature with the other.

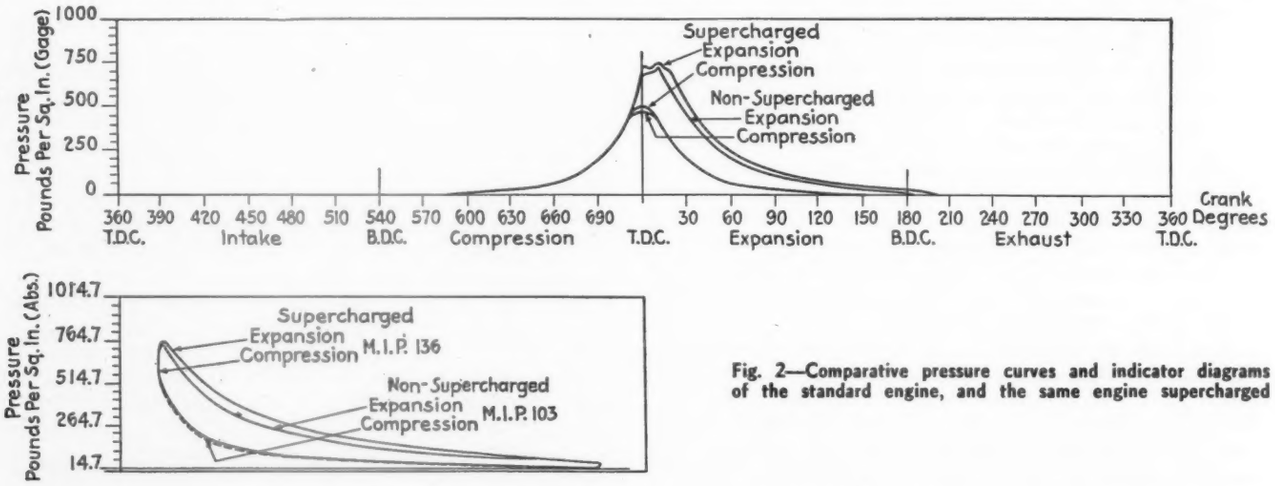


Fig. 2—Comparative pressure curves and indicator diagrams of the standard engine, and the same engine supercharged

In order further to insure complete scavenging of every part of the combustion chamber this must be made so that the air sweeps through the entire chamber in passing from the inlet to the exhaust manifold.

The pressure crank angle indicator diagram in Fig. 2 taken with a Cox sampling-valve-type indicator, also the pressure-volume diagram plotted from the above, shows clearly the increase in area of the card and illustrates how the increase in power is obtained.

The data in Table I shows the difference in performance of the standard and supercharged engine.

Table I—Comparative Performance of Standard and Supercharged Engines

STANDARD ENGINE (WITHOUT SUPERCHARGER)
Type six-cylinder—12½ x 13 in. Fuel pump 16mm. Timing 15 deg., 21mm. rack travel.

Time	R.p.m.	Volts	Amps.	Brake hp.	Temperature Water Inlet	Temperature Water Out	Temperature Oil Inlet	Temperature Oil Outlet	Oil Pressure	Exhaust Temperature	Exhaust Color	Fuel Consumption Lb. per b.hp.-hr.
6:00	700	600	685	604	170	177	168	175	38	840 855 840 840 840 840	Clear	.389
6:30	700	600	685	604	170	177	168	175	38	830 850 830 840 830 840	Clear	.396
7:00	700	600	680	600	168	175	170	178	38	830 850 830 840 830 840	Clear	.397
7:30	700	600	685	604	168	175	168	178	38	825 840 825 835 820 835	Clear	.394

STANDARD ENGINE (WITH ALCO BUCHI SUPERCHARGER)
Type six-cylinder—12½ x 13 in. Fuel pump 20mm. Timing 12 deg., 21mm. rack travel.

Time	R.p.m.	Volts	Amps.	Brake hp.	Temperature Water Inlet	Temperature Water Out	Temperature Oil Inlet	Temperature Oil Outlet	Oil Pressure	Exhaust Temperature	Exhaust Color	Fuel Consumption Lb. per b.hp.-hr.
12:00	700	600	1020	900	158	168	158	164	38	780 730 740 775 740 780	Clear	.368
12:30	700	600	1020	900	160	170	156	168	38	785 735 745 785 745 780	Clear	.371
1:00	700	600	1020	900	160	170	158	170	38	785 735 745 785 745 780	Clear	.371
1:30	700	600	1020	900	160	170	158	170	38	785 735 745 785 745 780	Clear	.371

EDITORIALS

Keep the Mechanical Associations Alive

One of the news pages of this issue carries the announcement that the Committee on Co-ordination of Mechanical Conventions in a recent meeting in Chicago attended by representatives of the Car Department Officers, International Railway General Foremen, International Railway Master Blacksmiths, Master Boiler Makers, and Railway Fuel and Traveling Engineers Associations decided against holding any convention of the associations this year but that, in order to avoid a break in the continuity of the proceedings, open business meetings of the officers and committee members of the several groups would be held on September 27 and 28 at the Hotel Sherman, Chicago.

Announcement was also made that the American Railway Tool Foremen's Association will unite with the General Foremen and it was suggested that efforts be made to revive the activities of the Master Blacksmith's group and affiliate it with the General Foremen.

Under the conditions that the roads have been forced to operate for the past eight years there is not a man in a railroad organization who has not heard talk about cutting expenses until many have reached a frame of mind where the saving of a dollar for labor and materials is considered of vastly more importance than the proper and intelligent operation of a business the job of which is to furnish efficient transportation under any conditions. It requires a great deal more hard thinking to run a business under conditions such as exist at the present time than it does when there is plenty of business and the supply of funds and men is sufficient to do a good job. The only object in mentioning this at all is to bring out the reason why these mechanical associations are of such inestimable value to the railroad industry and why every effort should be made to encourage their work, not only for the influence they have in making it possible for their members to function more efficiently on their respective jobs but in helping to hold up the morale of the supervisory organizations at a time when morale is not especially high.

After a lapse of several years four of these groups held conventions in Chicago last Fall which were an outstanding success in every way and many enthusiastic comments have since been heard concerning the meetings and the value of the reports and discussion of the variety of subjects that were considered. The impetus of last year's convention revived interest in the work of these groups with the result that some of them will, without doubt, have unusually complete committee reports to present at this year's meetings that will place on record the progress that has been made during the intervening twelve months.

The announcement concerning the possible affiliation of the General Foremen, Tool Foremen and the Master Blacksmiths gives rise to speculations as to what the future of these groups may be. All three of them, before 1930, were extremely active associations with a widely distributed membership and exerted an important influence in their respective fields. It is therefore a question in the minds of many as to why these three groups apparently have lost ground and are now in the position of having to build almost from the ground up. Possibly the answer may be that the conditions in the field have changed greatly; possibly it is because the older group of leaders of these three associations, who were the driving force that caused them to remain active, have laid down the reins of leadership expecting younger men to take up where they left off; possibly it is because the present officers of these associations have not faced certain facts as they are and rebuilt accordingly. It is rather difficult to believe that once-powerful associations such as these have lost their vitality simply because supervisors in the industry have become indifferent to their value. In the discussion of this situation with individuals it has been inferred that possibly some of the difficulty may be because these minor groups do not have the hearty support of the higher officers. This last possibility may be discounted for the higher officers have supported the associations that have continued to do a constructive job of planning programs which are of obvious value to their members and so to the railroads.

The minor mechanical associations came into being because of a very definite need for a place where groups of supervisors might consider the many individual ideas for improving methods for the operation and maintenance of mechanical equipment. The problems of design and standards have always belonged to the Mechanical Division. It has never been the function of these minor associations to undertake the formulation of policies for the industry, the development of working agreements between roads or to establish standards for the design of equipment or for materials. It has, however, been their function to bring together in one place the experience of the operating and maintenance forces relating to methods and supervising problems of the repair of equipment and the use of materials. In this manner the work of these groups has undoubtedly been of considerable value to the Mechanical Division.

When it is considered that expenditures for maintenance of equipment constitute a major part of railway

operating expenses and that locomotive repairs alone is the largest single expense account it seems strange that the day-by-day problems of the men responsible for the administration and supervision of this important part of railway work are not the concern of an influential association. Why is this not the logical field of endeavor for a new organization of broad scope which could easily be built out of the combination of the General Foremen, Tool Foremen and Blacksmiths? A single indication of what can be done in other industries is the rapid rise to a place of importance of the American Society for Tool Engineers, which has been built with an understanding of the important place modern tooling equipment has in industry.

The General Foremen's association has suffered a loss of membership by the transfer of interest on the part of the general car foremen to the Car Department Officer's Association and rightly so for that is where they belong—in an organization devoted expressly to the peculiar problems of car maintenance, inspection and interchange. This is one of the facts that must be faced, one that has been brought about by changed conditions. The real field of the General Foremen's association of the future is strictly locomotive maintenance and the group should be built with the idea of arranging programs of such broad interest that master mechanics, shop superintendents, both shop and enginehouse general foremen, certain department foremen, shop engineers and supervisors of shop machinery and tools will be attracted to its membership.

Obviously, as far as the work of tool foremen and the blacksmiths is concerned it probably will be worth while to build the organization in such a manner that their separate identities, as sections, may be maintained for it would not serve the objectives of association work to submerge these groups too deeply in the background of the broad problems of locomotive maintenance.

There is no question of the need for such an association. There is no question of the value of it to the supervisors in the mechanical department. The only question seems to be that of discovering a small group of leaders of sufficient vision to realize the opportunities, of sufficient courage to do the job that must be done under the present conditions and who have the ability to formulate plans of obvious benefit to their members and to the railroads. This having been done, the support for such an organization will be forthcoming.

Apprentice Training Methods

With a very few exceptions, apprentice training was badly neglected on the railroads of this country during the long, drawn-out depression. When business improved the railroads, recognizing this weakness, started to recruit apprentices and made efforts to improve their training methods. The "recession" slowed down or stopped these efforts in many instances, but fortunately, not in all of them. This is clearly reflected in the extracts from some of the letters from apprentices which have appeared on our Gleanings Page in recent months. These experiences naturally were paralleled more or less closely in the heavy or durable goods industries.

If we can find our way out of the economic haze, in which we have been groping for so long a time, and get back on a sound basis, a plentiful supply of well-trained craftsmen will be needed to catch up on deferred maintenance and to meet the demands for newer and higher types of services.

From the standpoint of the nation as a whole, greater skill on the part of the employees and new and improved facilities and equipment will be required to meet the competition for world trade from cheap labor in other countries. The railroads are the backbone of our transportation system, which is vital to the success of our commerce and industries, and they must do their full share by improving their effectiveness, not only for the general welfare, but also to protect their own interests in competing with other types of carriers.

In the early part of the present century, the railroads pioneered in the introduction of modern apprenticeship training methods. Some of them are giving an excellent account of themselves in this respect today, and yet, by and large, the most aggressive and advanced thinking in apprenticeship training is to be found in the industrial field. Railroad mechanical department officers, therefore, will do well to look into the best practices in that field for recruiting and training of apprentices and workers.

The Effect of Coal Fines On Fuel Consumption

It has been estimated that railroad coal costs in 1938 will increase by approximately $19,000,000 over the cost in 1937 as a result of new wage agreements and the National Bituminous Coal Act. Although the increased cost of railway fuel is largely out of control of railroad men, much can be, and has been, done to reduce the total amount of the fuel bill by designing locomotives and their firing equipment to produce higher boiler efficiencies, by keeping motive power in the best operating condition and by avoiding inefficient firing practices. The effective fuel conservation efforts of railroad mechanical-department officers working on their individual roads and through an aggressive specialized group like the Railway Fuel and Traveling Engineers Association were never more needed nor potentially productive in saving railroad fuel money than today.

In connection with this subject there is the addi-

tional item of fuel loss resulting from the use of coal containing high percentages of fines. Tests conducted about 15 years ago at Purdue University revealed that mine-run coal as received was such that 12.5, 19.94 and 31.3 per cent passed through ¼-in., ½-in. and 1-in. screens, respectively, and that the stack loss from this coal ran from 3 to 9 per cent. Coal purchased as 1¼-in. screenings was such that 37.59, 57.62 and 95.56 per cent passed through ¼-in., ½-in. and 1-in. screens, respectively, and that the stack loss from this coal ran from 12.5 to 17.8 per cent. With high stack losses increasing with the higher percentages of fines in the coal, much of which loss is either unburned fines or fines from which the volatile matter alone is burned, some thought should be given continuously to the grade of coal used as locomotive fuel.

At least one railroad in the east has undertaken a study of this problem. Besides trying to establish the fuel consumption on locomotive runs with coal as received from the mines, this railroad has also undertaken to determine what increase in fines result from handling the coal in the loading stations at its terminals, such increase resulting when coal drops from heights as much as 45 ft. against deflectors at the loading stations and into the locomotive tenders.

If the proper handling of coal at loading stations will reduce the percentages of fines therein and thereby effect a well defined decrease in fuel consumption, the study of such practice should be extended.

Freight Cars And Safety

Speeding up the operation of freight trains makes it necessary to take greater precautions to insure safe and reliable operation. Undoubtedly, freight cars of the older and obsolete designs would have been discarded long before this had conditions been more favorable in recent years. Fortunately, also, a steady improvement has been made in accident prevention, and yet it cannot be gainsaid much still remains to be done.

The suggestion has been advanced that mechanical department officers might well take a firmer stand in matters relating to the operation of obsolete freight cars or cars with poorly designed or defective parts. If a piece of track or a bridge is weak or defective, the engineering department clearly specifies the conditions under which it can be used, and the operating department sees that these conditions are observed. Ought not the mechanical department to take an equally firm position in the operation of the equipment in its charge?

The use of the arch bar truck in interchange service has again been extended to January 1, 1939, although past records show numerous accidents chargeable to such trucks. Director Patterson, of the Bureau of Safety, of the Interstate Commerce Commission, has consistently pounded on the need for periodic inspection of couplers and draft gear, and also that steps be taken to insure that the height of the coupler above the rail be maintained within specific limits under all conditions. Here certainly are problems demanding the best thought and action on the part of the mechanical department, and so much is involved it would seem the mechanical department officers could well afford to take a decided and firm stand to improve conditions.

Metal Spraying Possibilities

Metal spraying, the art of building up worn parts and the surfacing of others with corrosion resistants by metal sprayed from an air-turbine gun after being heated to a molten condition by an oxyacetylene flame, has not been used extensively in the railway field, in spite of the fact it has long been considered by the maintenance departments of other industries as an indispensable process. However, several railroads have made a study of the process and are now using it for building up piston rods, reverse-gear parts, stoker parts, air-pump piston rods, feedwater piston rods, and injector parts. These, as well as many others, have been successfully built up to size, and it has been found that they wear much slower after installation than the original parts; for example, a metal-sprayed and a new pump plunger were tested recently and it was found, after each had run the same length of time, that the metal-sprayed plunger had worn 30 per cent less than the new one.

One eastern railroad, which has been using metal-spray equipment since 1931, reports an annual return on its investment of approximately 350 per cent. It has been used in reclaiming parts of locomotive accessories and air-conditioning equipment, as well as the surfacing with corrosion resistants of equipment parts subjected to atmospheric and chemical corrosion.

With the continued advance in the use of internal-combustion engines for railroad motive power, the maintenance departments of the railroads might well investigate the advantages of metal spraying as used in other fields for tinning bearings to receive babbitt, and building up cylinders, pistons, crank shafts, bearing fits, valve and cam-gear parts, as well as other parts subject to wear and frequent replacement.

It is a rarity to see metal-spraying equipment in railroad shops and few mechanical officers seem to have any knowledge of the subject. On the other hand practically every major oil company owns and operates metal-spraying equipment. Many railroads are overlooking a device which could aid materially in cutting maintenance costs and improving the service of a very considerable list of specific parts of motive power and rolling stock.

Gleanings *from the* Editor's Mail

(The Apprentices Speak)

The mails bring many interesting and pertinent comments to the Editor's desk during the course of a month. Here are a few that have strayed in during recent weeks.

Blueprint Reading and Seniority

What we need to improve our apprenticeship is better and more schooling on blueprint reading. We receive two hours a week schooling on blueprint reading, arithmetic and trade theory, but that is not enough. They tell us to study at home, but what can you learn by yourself, if you have no one to explain the hard work to you? We should also receive more seniority. We get two years' seniority after putting in our apprenticeship for five or six years.

We Are Delighted

I am fortunate in working in a shop that, generally speaking, looks after its apprentices well. We have a good instructor and a superintendent who is doing all he can for us. I was informed that our shop superintendent has been following the apprentice articles (Gleanings Page) and has advised all shop foremen to be sure to keep apprentices strictly on schedule. This is just one case where your efforts for better apprenticeship programs have been recognized and have accomplished good results.

Frank Confession from a Special

When the railroad employed us, it started us at a good salary, and we were a loss to them for quite a while until we began to become acquainted with the various complexities of railroading. Therefore there has been quite an investment made in us, and in most organizations it would have been seen to that this investment was utilized to its best advantage. Does it seem strange that we wonder why there is no system adopted under which we would gain a fairly good vision of the scope of railroading, and not spend our three years in what seems to be a haphazard manner, our experience depending solely on the management under which we are placed, with an occasional release for test work? In this way some of us are quite fortunate, while some pass their time as a little better than a laborer, or in some cases, a super-office boy.

Capable Young Men Needed

Many young men with whom I have talked regard the present apprentice system, hopelessly, as a method of exploiting cheap labor. While I do not feel that this attitude is completely justified, there are many evidences that might lead one to draw such a conclusion. There is a distinct need for effective apprentice training today more than ever before, and I am considering the case from the viewpoint of the railways, as well as from that of the young men. Many of the reasons seem obvious to you and to me, but perhaps they need restating for the benefit of others. The average age of railway personnel is higher than in other fields—a fact not serious in itself, but indicating that young men are not being attracted to the railways to replace natural retirement. New equipment, methods and materials, higher train speeds, etc., create more exacting requirements in the mechanical and maintenance departments, and require specially trained men. Finally, there is a great need for a sympathetic group of employees to assist in combating the trend toward government ownership.

Conditions Ideal — Almost

I am happy to report that conditions at our shop are ideal, almost. That is, we have a full time instructor, full co-operation of our supervisors, technical data through an I. C. S. course, mechanical drawing, and a class room that isn't big enough or fit for storage. We secure the least co-operation from the "old timers," who received their training via the helper route. Their first salutation is "Howdy, mate, make yourself at home, anything you want to know, just ask me." We do ask. Maybe they can't answer all our questions, so they tell us after a few questions, "Ask that———good for nothing, lazy, etc., instructor, that's what he gets paid for; I'm too busy to answer questions all day." They let us act as "tool getters and taker backers" and all-around Western Union boys. Sometimes they will let us clean the dirt and grease off a job and lots of times let us swing the sledge. We are willing to work, realizing that experience is the best teacher; but we want to do *the work*. We find an ideal attitude among those who served an apprenticeship. They explain the work and give us plenty of information that isn't in the book. They let us do the work, correcting us and giving us helpful hints.

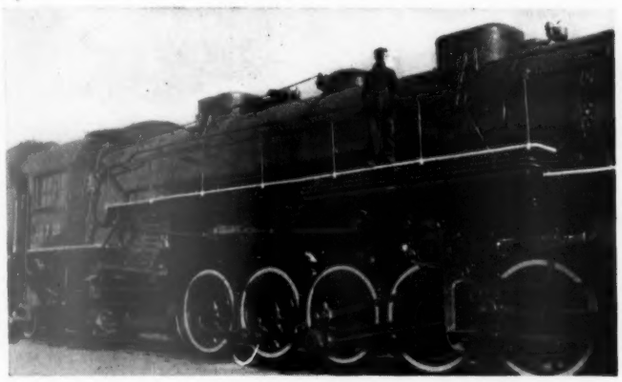
Apprentice Classes on Company Time

Apprentices on the Canadian National attend class two hours each week, the total number of hours being limited to five hundred during an apprenticeship. Two or three classes are held each day and the number allotted to each class is from 10 to 15 apprentices. The classes are kept down to the smallest possible number to avoid taking too many apprentices from the shop at one time. The class time is apportioned to the study of mathematics, drawing and trade theory. In the study of mathematics an apprentice is required to make a review and is then given a test examination, in order to find out in what part of the book he should start to study. This is done to prevent time being spent on a subject with which the apprentice is familiar. In drawing, most of the first year is spent on geometrical drawing and projection, then on simple mechanical drawing, the apprentices making their drawings from objects. The importance of sketching is stressed; all apprentices may not make draftsmen, but they are all taught to make an intelligent working sketch. In trade theory the apprentice studies a textbook that applies to the work that he is doing in the shop, i.e., when on lathe work in the shop, the textbook studied in class is on lathe work. By this method the apprentice gets the theory of the work, which helps him in the practical shop work. Quite a number of the draftsmen working for the company are ex-apprentices who received their first training in drawing in the apprentice classroom. The railway does not believe it is a good policy to pay an apprentice for all the time that he must spend in study. The company pays for the two hours spent in class each week, but the apprentice must spend at least two additional hours a week in home study. It is gratifying to the railway to see the interest taken in class study and the majority of apprentices spend much more than two hours a week on study in their own time.

IN THE BACK SHOP AND ENGINEHOUSE

Safety Railings for Running Boards

The illustration shows safety railings applied to the outer edge of running boards of Bessemer & Lake Erie locomotives for the protection of mechanics when it is necessary for them to use the running boards while making locomotive repairs in shops and enginehouses. These railings, except the sockets which hold the vertical posts in place, are removable and are taken down before the locomotive leaves the shop or enginehouse.



Safety railings applied to running boards of B. & L. E. locomotives undergoing repairs

This device consists of, first, a series of permanent sockets spaced about 5 ft. apart along the outside edge of the running board; second, a number of vertical removable posts which are held in place by inserting the bottom of each post into the socket; and, third, several lengths of ¼-in. chain, each length being about 5 ft. 6 in. overall length and extending horizontally from a slot in the top of one post to a similar slot in the top of the next post, there being a single chain between each two adjacent posts. The illustration shows this railing as applied in six sections to the entire length of a running board. However, one or more sections may be used at one time, depending upon the nature of the work to be performed.

Each post socket is a 3-in. length of 1¼-in. pipe, with a steel disk, ¼ in. thick, welded within the pipe flush with the lower end; this disk has a ½-in. hole for drainage. The bottom of the post rests on the top of this disk. These sockets are welded to the outer face of the angle or tee at the outer edge of the running board, with the top of the socket flush with the top of this angle or tee.

Each post is a 3-ft. length of 1-in. pipe, flattened at the top for a distance of 3 in., the post being so inserted in the socket, or so rotated after insertion, that this flattened portion extends crosswise of the locomotive. In the middle of this flattened portion is a vertical slot, open at the top of the post and extending 2½ in. downwards, into which the ends of the two adjacent lengths of chain are placed. The ends of the chains extend slightly past the slot in the post.

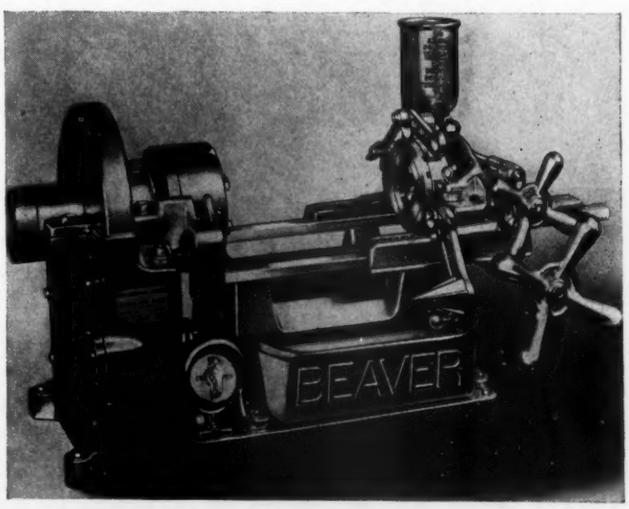
At the top of the flattened portion of the post, above the chain links in the slot, are two $\frac{7}{32}$-in. holes in line horizontally, one on each side of the slot. At each of these holes a $\frac{3}{16}$-in. bolt and nut is applied to hold a flat keeper bar which prevents the chains from being accidentally pushed upward out of the slot.

To remove the railing, one keeper bolt is removed from the top of each post and the other bolt loosened, after which the keeper is rotated around the loosened bolt until it ceases to interfere with lifting the chain out of the slot at the top of the post. The chains are then lifted out of the slots, and the posts are lifted out of the socket.

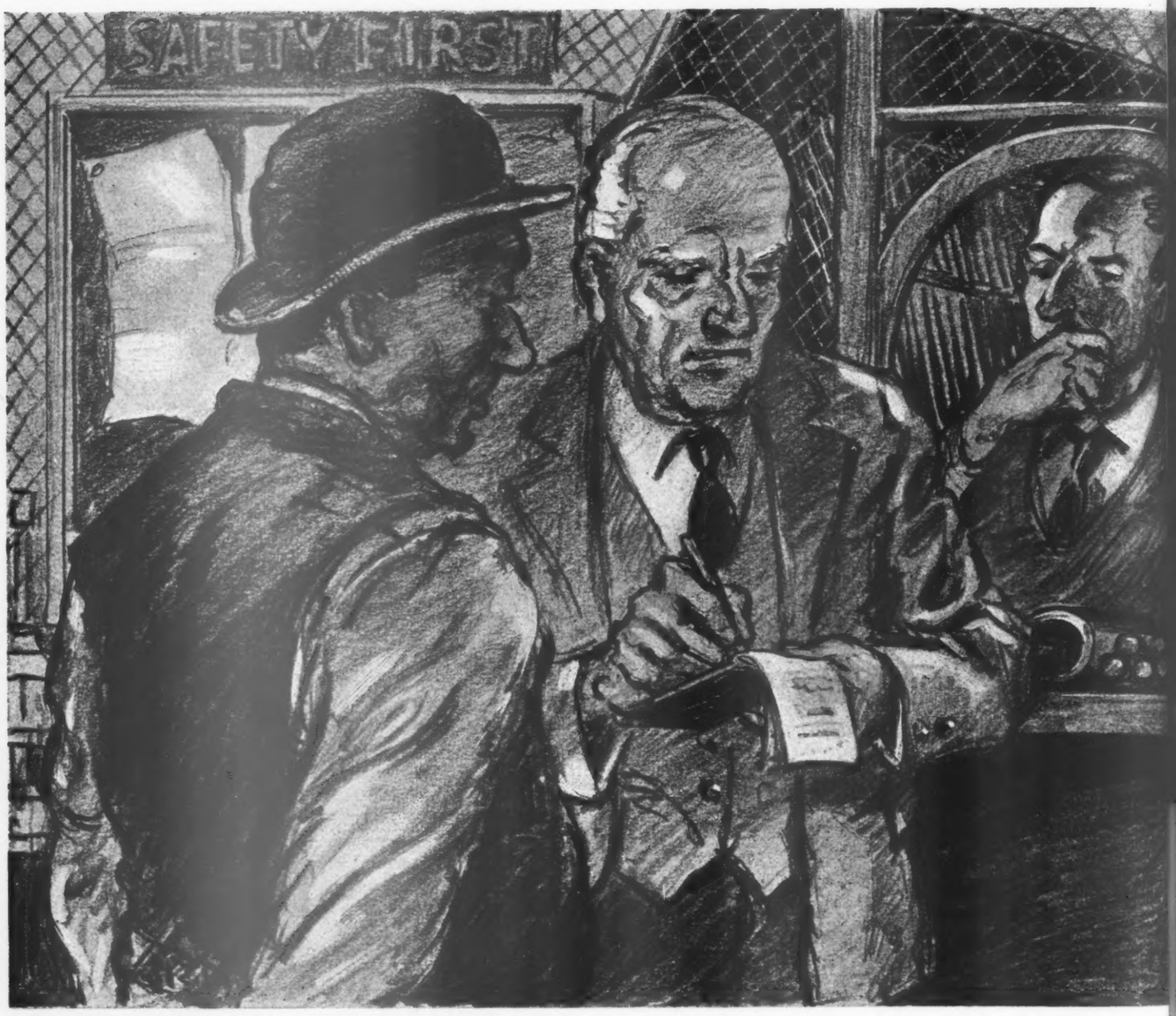
Power Drive Converted To Pipe Machine

The Beaver Pipe Tools, Inc., Warren, Ohio, recently announced that users of pipe and bolt cutting machines can purchase the illustrated Beaver Model-B pipe and bolt machine complete as shown, or in units starting with the simple Model-B power drive. The power drive is used to operate all makes of hand pipe threaders, cutters, and reamers for fabricating pipe from ⅛ in. to 2 in. diameter. It can also be used with a drive shaft to operate gear tools to cut and thread pipe sizes from 2½ in. up to 12 in.

The Model-B power drive can be converted into a complete ⅛-in. to 2-in. portable pipe and bolt cutting and threading machine as follows: The cap from the gear case is first removed and the spindle is reversed so that the chuck is directly over the motor. The cap is then replaced and an automatic chuck wrench ejector added. Next the outboard pipe support and sliding pipe rest used with hand tools are removed. The hood is then placed over the motor and bolted in position after which the carriage, reamer, and chip trays are placed in position. Finally a wheel or knife cutoff unit, whichever the user specifies, is added and a quick-opening adjustable die head is mounted on the chuck. Finally an oil reservoir is added. When these operations are completed the Model-B machine will be ready for use. Shop time for making these alterations is estimated as 12 min.



Complete pipe and bolt machine converted from a Beaver Model-B power drive



EXTRAVAGANT ECONOMY

***by* Walt Wyre**

WHEN Jim Evans told the superintendent of motive power that one reason for excessive use of material in the Plainville roundhouse was because the stores department didn't keep enough material on hand, the S. M. P. thought the roundhouse foreman had a couple of nuts loose.

"If they don't buy material," the superintendent of motive power snorted, "how can you use it? I suppose the reason for using over 30,000 pounds of brass last month was because there wasn't any bought! Piston packing, driver tires, valve bushings—look at this!" The official slapped the desk with his fist so hard that the sheet of paper with the figures on it danced. "No wonder the S. P. & W. is not making any money!"

Evans, accustomed to the outbursts of the superintendent of motive power, waited patiently for him to calm down before attempting to explain. The foreman bit off a hunk of "horseshoe" and moved his chair around so the cuspidor would be convenient.

"And look at our labor costs!" The S. M. P. pointed accusingly at figures on another sheet of paper. "Don't tell me all that money was spent because you didn't have material!"

"Part of it was," Evans replied in a matter-of-fact tone.

If the S. M. P. had a pressure gauge on his think tank, the needle would have bent the peg on the high side. He roared like a passenger train going uphill through a deep cut.

"There's no excuse for the cost of turning power being

Out came the little black book. "I'm beginning to see why we are using an excessive amount of material and labor costs are running up", the superintendent of motive power commented

so high at this point, and I'm going to stick around here awhile and find out why!" he snapped.

"Well, if you'll excuse me a minute I'll go see how they're coming with the engine for 82. It's called for 10:15 and not out of the house yet," Evans said, rising.

The official grunted something that Evans took for acquiescence and he headed for the roundhouse.

The foreman found the hostler sitting in the cab of the 5086 that was to be used on the fast freight. "What you waiting on?" Evans asked.

"Waiting on machinists to finish," the hostler replied.

Machinist Cox was standing by the locomotive leaning on a side rod. The nut and collar were missing from the crank pin.

"How much do you lack?" Evans asked.

"Just the side rod collar and nut," Cox replied. "Threads were stripped on the old one."

"Where's your helper?"

"He's in the machine shop waiting to get a nut bored out and threaded to fit. There wasn't any in the storeroom," the nut-splitter explained.

The 5086 got out without any delay, but it wouldn't have if the engine crew hadn't got on her in the roundhouse and fortunately the locomotive had almost a full tank of water and didn't need any oil.

After lunch the superintendent of motive power was in a better humor. He had gotten rid of his excess steam before noon.

About one-thirty John Harris, the roundhouse clerk came to the machine shop looking for Evans. "The 5091 broke a driver tire," the clerk told the foreman.

"Where did it happen?" Evans asked.

"Just this side of Walker's switch," Harris replied. "The dispatcher wants to know how soon you can send an engine out to bring the train in," he added.

"Tell him the 5088 and right away. She came in on 82 and is still hot. Wonder if the 5091 can make it in?" Evans pushed his hat back and rubbed his head thoughtfully.

"Don't know," the clerk said as he started back to the office.

"What are you going to do?" the S. M. P. inquired.

"It's only about seven miles out," Evans said. "I've got my car here. Believe I'll drive out and see what the engine looks like. Want to go?"

The official did. Ten minutes later with a machinist and helper they were on their way.

Fortunately, aside from the broken tire, no great amount of damage was done and the 5091 was able to come on in light at slow speed. It reached Plainville a little after three o'clock. Evans had been back at the roundhouse nearly an hour.

"Why the tires are almost new," the superintendent of motive power commented when he looked at the engine. "Have you got one on hand?"

"Afraid not," Evans said. "I'll ask the storekeeper."

"No, haven't got any tires for a 5000." The storekeeper picked up a clip board and began to thumb through a bunch of requisitions. "I've got some ordered but they haven't been shipped yet. I'll rush them."

"How long do you think it'll take to get them?" Evans asked like a person expecting bad news.

"Oh, ten days or two weeks," the storekeeper said.

"Can't you get them sooner than that?" the S. M. P. asked with a trace of irritation.

"Afraid not, but I'll do my best."

Evans swore mildly as he rose to leave.

"Now what are you going to do?" the official asked Evans as the two left the storeroom.

"Got to do a little figuring," the foreman told him. "Don't see how I can do without the 5091 two weeks. She's just off the drop-pit in good condition and I sure need good engines bad." Evans spoke more to himself than to the S. M. P.

NEXT day the inspector reported that the 5076 would be due for a five-year test in two more days. One more trip and she would have to be tied up. On top of that the morning lineup showed two C. C. C. specials for that night. By the next morning serviceable engines would be plenty scarce in Plainville.

"Well, I guess that's that!" Evans remarked as he laid the lineup on the desk.

"What's the matter now?" the superintendent of motive power asked.

"Just another case of the high cost of turning engines going higher," Evans replied without intending to be sarcastic.

"What are you going to do?" the official asked.

"Got to get a tire on the 5091 and have her ready to run by to-morrow afternoon. " Evans reached for the lineup and handed it to the official.

"Where you going to get a tire?"

"I've got to get one somewhere," Evans said seriously as he started to leave the office.

The foreman went to the tool room and got a tire caliper and from there to the cement platform near the storeroom where tires were stacked. After measuring every tire that looked as though it would do, the fore-

man found one that could be used. It was worn almost to the limit. He marked the tire with a piece of yellow keel and headed back for the roundhouse. He met the superintendent of motive power near the drop pit.

"Did you find one?" the official wanted to know.

"Yeah, I found one that can be used, but I'll have to turn all the other tires on the 5091 to match.

"That'll take a lot of miles off them."

"Yes," Evans agreed, "but I don't see any other way out of it. Do you?"

"Afraid not," the S. M. P. said as he made notes in his little black book.

By four o'clock the next afternoon the wheels had been dropped, nearly an inch cut taken off each tire except the new second-hand one, and the wheels were back in place. Machinists were putting the rods up when Evans took a call on the engine. It was the only one available for an extra west that the dispatcher was worrying about.

THE foreman was in the roundhouse office alternately chewing his finger nails and a pencil as he attempted to answer some of his correspondence when the engineer that brought the west bound extra in came to the office. "Say, that 5090 I just came in on will have to have new piston packing."

"Which side?"

"Both sides. They're blowing like a politician a week before election. I had to double Clear Creek hill and if the booster hadn't been working I wouldn't have got over then. Gimme a work report," the engineer added.

A night machinist pulled the pistons from the 5090. Evans looked at them just before eight o'clock next morning. No argument about it, new rings were required to put the engine in condition to run. When the eight o'clock whistle blew, the foreman gave machinist Clark the work slips on the engine and a requisition for two sets of rings.

Fifteen minutes later Clark found the foreman. "There are only two rings in the storeroom of the right size," the machinist said.

Evans pondered a minute. then said, "Well, put them in the side that looks the worst and put the pistons in, rings or no rings. We've got to run her."

"Both sides are the worst," the machinist said. "What I mean is the packing is completely down."

Evans pondered again. "I'll take a look."

The machinist was right. The rings on both pistons were two trips overdue at the scrap dock. The foreman looked at first one then the other. Suddenly he raised up and said, "Take all of the rings off without breaking them if you can, and whatever you do, don't break over two of them."

"Might as well be broke," the machinist muttered as Evans walked away, but the nut-splitter proceeded to follow instructions. By working carefully he removed all of the rings without breaking any of them.

In the meantime the foreman went to the storeroom and started to look around.

"What are you hunting?" the storekeeper inquired.

"Afraid you haven't got it," Evans replied, half joking, half serious. Then he stopped by the rack where rolls of metal used for shimming locomotive tires were stored. He pulled out about a foot from a roll of one-sixteenth of an inch shim stock. "This stuff has got quite a bit of spring to it," Evans remarked.

"Yeah, it's pretty good metal," the storekeeper agreed. "Could I sell you some of it?"

"Let's see your tin snips," Evans replied.

"Want to take a sample with you?" the storekeeper asked as he went to get the tin snips.

The metal was hard cutting with a pair of tin snips, but Evans managed to cut off a piece about ten inches long. He then cut a strip of the metal approximately three-eighths of an inch wide lengthwise of the piece. He went back to the roundhouse carrying the narrow strip of metal, bending it back and forth as he walked.

The storekeeper stood and watched, wondering who was nuts, he or the foreman.

The machinist was cleaning the ring grooves on the right piston when Evans came up. "How did you make out?" Evans asked.

"O. K.," Clark replied. "I got all of the rings out without breaking them."

"That's good because you may break one or more putting them back in." The machinist gave Evans a hope-you-are-harmless look; the foreman continued, "Here's what I want you to do. Go to the storeroom and get a strip of one-sixteenth shim stock about half again as long as the distance around the piston. Understand?"

"Be about ten feet long?" The machinist laid a folding rule across the diameter of the piston.

"Yeah; then I want you to cut two strips of the shim stock just wide enough to fit loosely in the ring grooves."

"But why one and a half times as long as the distance around the piston?" the nut-splitter wanted to know.

"May not need to be that long, but I'll show you when you get the strips."

While the machinist was getting the shim stock and taking it to the power shear to cut the strips, Evans went to the roundhouse office to see how things were coming along there. He had been so busy figuring how to get engines out that he had entirely forgotten that the superintendent of motive power was on the job.

That official was in the office looking over work reports, checking overtime and prying into things in general when Evans entered.

"Say, it looks like there's been a lot of unnecessary overtime," the S. M. P. said.

"Yes, and I'm afraid there's going to be some more, but I don't see any way around it." Evans explained about the piston rings and added, "That's just an example."

While the two were talking, the engine inspector came in to give a work report to the clerk to copy.

"What you got?" Evans asked.

"It's the 5087," the inspector replied, "and there's quite a bit of work on her. All of the rod bushings are worn, some of them past the limit," he added.

"Yeah," Evans sighed, "we've renewed most of them every trip for the past month."

"Why don't they last longer?" the superintendent of motive power asked.

"Well," Evans replied, "there are several reasons. The pins are out of round and driving boxes pounding. I'm going to run her over the drop-pit soon as the storeroom gets in some crown brasses for her. I'll have the pins trued up at the same time."

The official made some notes in his little black book and went out to look at the locomotive.

It took the machinist and his helper over two hours to cut the strips and fit them in the grooves. The power shears were a little out of line and the mechanic couldn't make them cut straight. After getting the first strip he cut too narrow near the middle, he cut the next two a little wide and finished them to size by draw filing.

The superintendent of motive power, after looking over the 5087, walked out to the shop to look around a bit. He found the machinist filing the strips and wanted to know what they were for.

"I guess they are to shim up the old rings on the

5090. There wasn't but two new rings to fit her in the storeroom," Clark explained.

The official watched a few moments then walked away. He met Evans coming back to the shop and went with him.

"Strips are finished," Clark told the foreman. "Now what do I do with them?"

"Here, bring them over to the work bench," the foreman replied. "Get a ball pein hammer."

Evans opened the jaws of a vise about three inches, then laid one of the strips across the opening. He struck the shim stock with a hammer, bending it into the shape of a wide shallow V. Then he moved it three inches, turned the strip over and formed another V in the opposite direction.

"I see," the machinist said. "You want to make the strip corrugated so it'll have some spring to it and give them old rings some snap."

"That's what I hope," the foreman replied. "Put an old ring with a spring under it and a new ring on each piston."

"Looks like it might work," the superintendent of motive power said as they walked away.

"SAY, Mr. Evans, the 5073 needs new valve bushings on the left side again," a machinist came up and said.

"What does he mean—again?" the S. M. P. asked.

"Has only been a few trips since the bushings were renewed," Evans explained. "The bull rings are worn so badly that bushings don't last long. You see—"

"Let me finish," the official cut in. "There aren't any bull rings in the storeroom, and you are using more bushings because you haven't any bull rings."

"That's right."

"Let's go to the storeroom . . . What's the trouble we can't get material when we need it?" the superintendent of motive power asked the storekeeper.

"I order everything the foreman asks for," the storekeeper replied. "But sometimes it takes quite awhile to get it and sometimes we don't get it at all. You see, the railroad hasn't got the money to buy everything they need."

"But we've got to keep the engines running and we can't do it without material," the S. M. P. argues.

"That's right," the storekeeper agreed, "but—"

"Got a middle connection brass for a 2700?" a machinist helper asked from the counter.

"No," the material clerk replied.

"You can use a 5000," the storekeeper said. "It's just a half inch bigger outside and an inch and a half longer."

"How much more will it weigh?" the official asked.

"Oh, about five pounds."

"Uh-huh, five pounds more brass in the scrap and extra time for a machinist cutting it off on the lathe."

The material clerk laid the brass casting on the counter. "Is that all?"

"No," the helper said, "I want six one-inch bolts eight inches long."

"Nuts?" the clerk said, meaning did he want nuts for the bolts.

"Yeah, eight hex."

The clerk returned. "Have to give you one by tens. Haven't got the eights."

Out came the little black book. "I'm beginning to see why we are using an excessive amount of material and labor costs are running up," the superintendent of motive power commented.

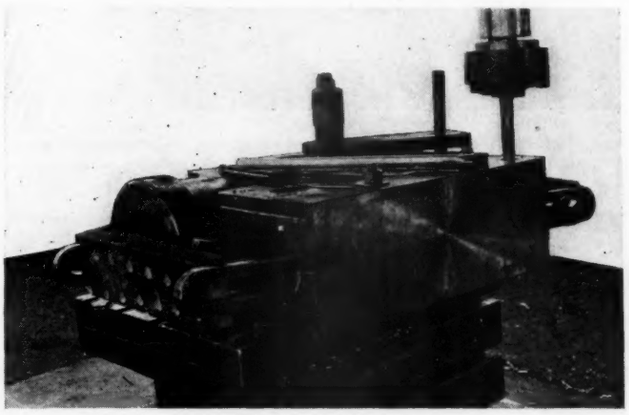
"Yeah, we sure are using lots of it, especially brass and valve bushings," the storekeeper said. "If we got everything we ordered I don't know how much we would use."

"Well, if Evans uses as good judgment ordering as I think he does, my opinion is we'd use a whole lot less," the superintendent of motive power said. "It seems to me like a case of extravagant economy."

Evans nodded and reached for his plug of "horseshoe."

Reaming Crosshead Bolt Holes with a Drill Press

To avoid the breaking of reamers while reaming tapered holes for crosshead bolts at the Pen Argyl shops of the Lehigh & New England a foreman designed the illustrated universal chuck which is threaded to a socket for application to a drill press. The universal chuck is tightened sufficiently to revolve the reamer but loose enough to permit slipping of the reamer should it become fast in the bolt hole. When the reamer slips it is removed from the hole, cleaned and oiled, reinserted and the reaming continued. Since the application of the universal chuck for this purpose the breakage of reamers has been entirely eliminated.

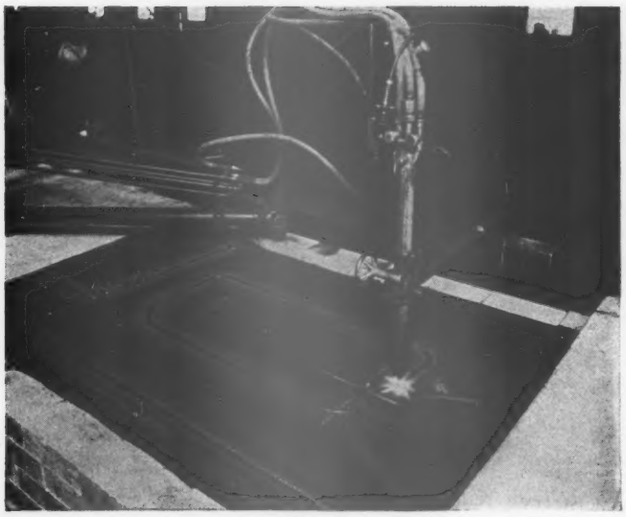


Application of a universal chuck to the spindle of a drill press for reaming crosshead bolt holes

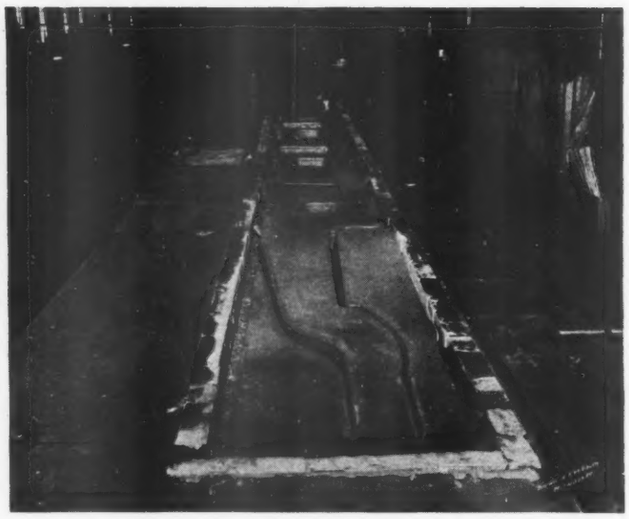
Cutting Locomotive Frames In the Back Shop

Four side-frame sections for a mallet locomotive were recently machine gas cut from SAE 2035 rolled steel slabs in the Milwaukee, Wis., shops of the Chicago Milwaukee, St. Paul & Pacific. Each of the slabs was 23 ft. long, 34½ in. wide, 5 in. thick, and weighed 14,800 lb.

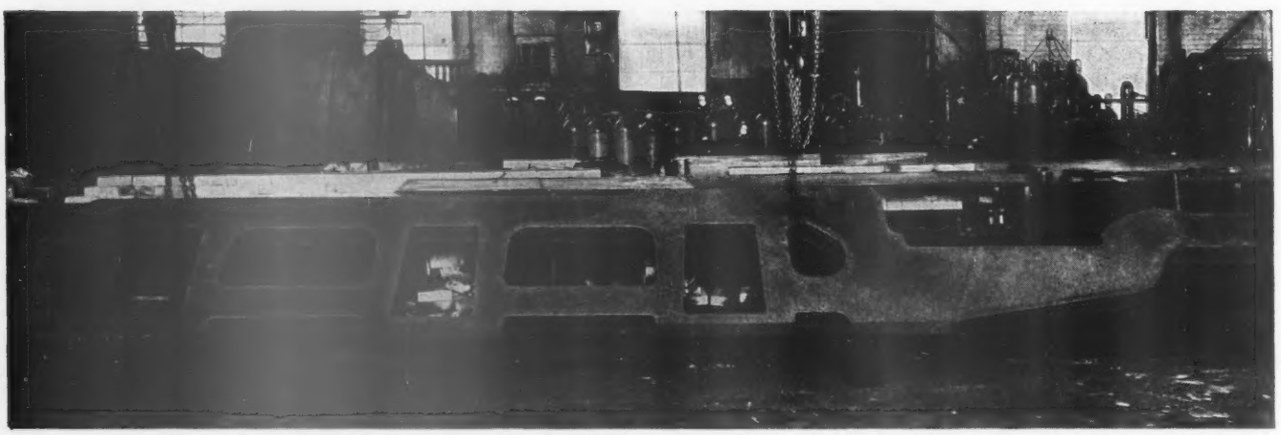
This shop is equipped with an Airco-DB No. 1 Travograph, which has a range of a maximum rectangle 4½ ft. wide by 11 ft. long. In order to cut the frame section, 23 ft. in length, with this machine, it was necessary to use 32 ft. of track and make some changes on the torch and tracer mountings. This was done to accommodate the extended tracing table which was positioned outside the standard table and parallel to the cutting table. Two 16-ft. lengths of rail are now used to permit enough longitudinal travel for cutting the 23-ft. long slab. The tracing table is extended beyond its normal position, and an extension for the manual tracer is just long enough to take care of this extension. The cutting table, and location of the 34½-in. wide steel slab, is



The torch and extension arm, showing cut in progress on a frame window



View of the frame from the front end taken when the cutting was completed



The machine gas-cut locomotive frame—One of four for a mallet-type locomotive

closer to the Travograph rails than standard practice; the torch, however, is extended towards the rails to accommodate this change.

The steel slab was preheated before cutting, a brick furnace being used as shown in one of the illustrations. Asbestos sheets bridged the bricks and covered the slab by lapping the joints. Preheating was accomplished by two oil burners. The cutting torch was directed by the manual tracer following a soapstone pencil layout on the top of the steel tracing table.

The slabs were preheated with oil burners for about 8 hours, slowly bringing them up to a temperature of 600 deg. F.; this was checked carefully by a pyrometer to eliminate guesswork. The asbestos sheets which formed the top of the furnace were removed to expose only the section being cut and were replaced as soon as the cutting on the section was completed. Seven starting holes were pierced for the starting of cuts in the openings. Test coupons were cut from two different points specified by the metallurgist. The data given in the table were obtained on this job. The weight of the slab at the start was 14,850 lb., while the estimated weight of the completed frame section is 5,000 lb.; this indicates that approximately two-thirds of the material in the slab may be worked up into miscellaneous forgings.

Performance Data in Machine Gas-Cutting Mallet Locomotive Frames*

Cutting time, hrs. and min., approx.	3-15
Cutting tip, type	Style 144, No. 6
Oxygen pressure, lb.	60
Acetylene pressure, lb.	4
Cutting speed, in. per min.	6
Linear feet cut	97
Oxygen consumption, cu. ft.	1,055
Acetylene consumption, cu. ft.	63
Oxygen consumption per linear foot, cu. ft.	10.87
Acetylene consumption per linear foot, cu. ft.	0.65
Ratio of oxygen to acetylene	16.75:1

* Air Reduction Sales Company, New York, Airco-DB No. 1 Travograph used.

Compound for Oil, Water and Steam Lines

The Kenite Laboratory, 83 Murray Street, New York, has recently introduced into the railroad field two products known as Kenite Joint Compound, for use on steam, air and water lines in power plants and on locomotives and cars, and Kenite Oil Pipe Plastic for use wherever it is desired to stop oil leakage. Both of these products are plastic in character, an essential difference being that the joint compound remains plastic at all times, while the

oil pipe plastic hardens in contact with the atmosphere while remaining semi-plastic underneath the surface.

The joint compound is especially adapted to steam and air lines with threaded or flanged connections under pressure. On coach heating lines it has been used successfully on six-inch gaskets under 85 lb. pressure, and in power plants on steam lines and boiler studs under 500 lb. pressure. It is also used on air, water and steam lines and on boiler studs on steam locomotives and for yard and car air lines.

Used as a joint compound on threaded pipe connections it has peculiar qualities of elasticity which make wicking unnecessary by providing a joint-sealing material that does not set up hard, but remains flexible and adjusts itself to the contraction and expansion of the joint. It is said that its adhesive qualities prevent it from breaking loose from the pipe surfaces and passing through the pipe. This feature is of importance in locomotive piping, in order to prevent interference with the operation of such devices as triple valves, power reverse gears, etc.

The oil pipe plastic has been applied successfully in the railroad field as a sealing medium on joints which are required to be oil-tight, such as oil lines and cover plates on Diesel engines.

Locomotive Boiler Questions and Answers

By George M. Davies

(This department is for the help of those who desire assistance on locomotive boiler problems. Inquiries should bear the name and address of the writer. Anonymous communications will not be considered. The identity of the writer, however, will not be disclosed unless special permission is given to do so. Our readers in the boiler shop are invited to submit their problems for solution.)

What is the Color of Overheated Crown Sheets?

Q.—What color would the fire side of the crown sheet be if the sheet had been touched up just enough to spring the head of the crown bolts? What color would the crown sheet be on the water side, or what indication would there be on the water side?—S. A. W.

A.—The overheated areas of crown sheets show a deep blue color, which is characteristic of overheating.

Why Flange Knuckles Crack

Q.—What causes the backhead of a locomotive boiler to crack at the knuckle of the flange? Sheets are of an alloy content. Can it be remedied?—G. J. F.

A.—The cracking of the boiler sheets at any point is due to expansion and contraction strains set up by the buckling effect on portions of the boiler not free to expand and contract with heating and cooling of the boiler.

The expansion and contraction of the boiler shell and firebox wrapper sheet is not the same as that of the boiler tubes and firebox sheets. This unequal expansion and contraction between the shell on the outside and the tubes and firebox on the inside causes a working of the backhead, the strains of which are carried by the knuckles at the sides of the backhead.

The proper handling of the locomotive to reduce to a minimum the actual causes of expansion and contraction, such as the excessive use of the blower, the blowing down of the boiler too soon after fires are drawn, the use of cold water in washing boilers, the forcing of the fire too rapidly, would aid considerable in the prevention of cracked backheads.

A practical remedy is to reenforce the knuckle with a patch on the outside, or, when applying new backheads, reenforce the knuckle with a plate on the inside of the knuckle; this reenforcing plate strengthens the knuckle and transfers the strains out into the flat plate, thus preventing the cracks from starting.

A Correction — Reason for Removing Flexible Staybolt Caps

Q.—Referring to your January, 1938, issue of the *Railway Mechanical Engineer*, page 37, "Locomotive Boiler Questions and Answers": Item (e) of this question is not properly answered. Item (e) in this issue reads as follows: "Staybolt caps shall be removed or any of the above tests made whenever the United States inspector considers it desirable in order to thoroughly determine the condition of staybolts or staybolt sleeves."

The I. C. C. rule on this matter reads as follows: "Staybolt caps shall be removed or any of the above tests made whenever the United States inspector or the *railroad company's inspector* considers it desirable in order to thoroughly determine the condition of staybolts or staybolt sleeves."—J. R.

A.—J. R. is correct. Rule 23 (e) as shown on page 37 of the January, 1938, issue should be corrected to include both United States and railroad company's inspectors as stated in the question.

Thickness of Dome Cap Calculated

Q.—Kindly advise me as to the method of determining the thickness of a dome cap of a locomotive boiler.—A. D.

A.—The thickness of a locomotive dome cap, which is an unstayed flat head, unpierced and is rigidly fixed and supported at the bounding edges by bolts or studs, can be computed from the formula

$$t = a\sqrt{\frac{0.162\ P}{S}}$$

where t = thickness of plate, in.; a = diameter or short side of the area measured to center of the dome-cap gasket, in.; P = maximum allowable working pressure, lb. per sq. in.; TS = ultimate tensile strength, lb. per sq. in., stamped on the plate as provided for in the specification for the material; and S = allowable unit working stress, (TS/factor of safety), lb. per sq. in.

Assume a locomotive boiler having the following characteristics: Steam pressure = 225 lb. per sq. in.; diameter of dome gasket = 25½ in., I. C. C. factor of safety = 4; and tensile strength of steel = 55,000 lb. per sq. in. Thus, we have $S = 55{,}000/4 = 13{,}750$ and

$$t = 25.5\sqrt{\frac{0.162 \times 225}{13{,}750}} = 1.3 \text{ in.}$$

The required thickness of the dome cap would be 1 5/16 in.

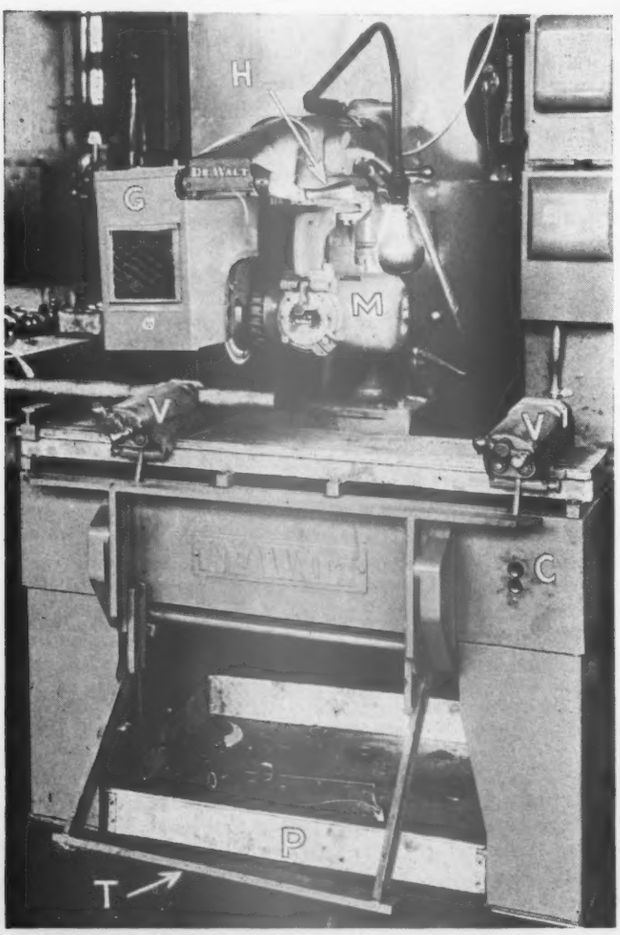
Dome caps of locomotive boilers are, as a rule, finished where the caps are secured to the dome. This finish would require the plate, from which the dome cap was made, to be at least 1/16 in. thicker than the thickness of the finished portion of the cap; thus, the thickness of the plate for the dome cap herein calculated would be 1⅜ in.

With the Car Foremen and Inspectors

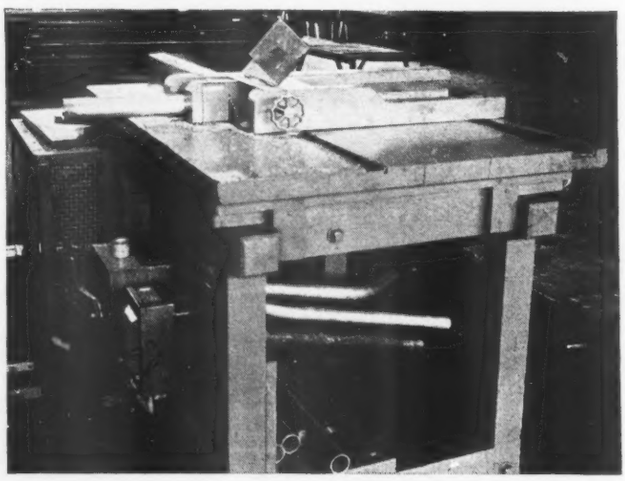
Pipe-Cutting Machines At Milwaukee Shops

Two compact and efficient pipe-cutting machines which are giving exceptionally good service at the Chicago, Milwaukee, St. Paul & Pacific passenger car shops, Milwaukee, Wis., are shown in the illustrations. The first of these is a metal-cutting friction saw, developed by the De Walt Abrasive Products Corporation, Lancaster, Pa., the machine illustrated being particularly well adapted for cutting steel and brass pipe because adequate power is available to make the cuts quickly, square with the centerline of the pipe and leaving only a thin fin which may be readily broken off by hand. All pipe sizes up to 2½ in. may be cut.

Referring to the illustration, the construction of the machine is apparent. The pipe is held square with the abrasive wheel in one or two vises *VV* as may be necessary. The carborundum abrasive wheel or disc is 18 in. in diameter and ⅛ in. thick, being mounted on the shaft of a compact high-speed electric motor *M*, which operates at 3,500 r.p.m. and develops 7½ hp. The motor is supported in an indexed bracket, which permits making angle cuts about a horizontal axis, the upper part of the bracket being capable of transverse movement in V-ways in the upper head of the machine. This head is clamped to a vertical post at the rear of the machine, thus permitting adjustment for angle cuts about a vertical axis. Hand feed for the cutting operation is obtained by means of handle *H*, which operates a sprocket wheel and chain drive connected to the motor-supporting bracket. Foot treadle *T* gives quick release of the vise pressure for adjustment of pipe position and a galvanized pan *P* catches the scrap pipe ends. The machine is easily started and stopped by means of push buttons *C*.



De Walt metal-cutting friction saw installed in the Milwaukee passenger car pipe shop



Milwaukee shop-made saw for use in cutting copper and aluminum tubing

The special sheet-metal guard *G* was developed to furnish additional protection to the operator in case of breakage of the wheel. A hinged panel in one side of this guard gives ready access to the wheel when necessary to make a change and the safety glass permits inspection of the sawing operation without eye hazard. When the glass becomes clouded by action of the abrasive particles a new square may be inserted at small cost. The shielded electric light installed on the machine helps production by giving excellent illumination just where it is needed.

Cutting Soft Metal Pipe

For cutting soft metal pipe and tubing at the Milwaukee car shops, the machine shown in the second illustration is also used to advantage, consisting of a substantial wood table with well-braced legs which carries a self-contained 12-in. circular wood saw, belt driven from a 5-hp. electric motor mounted at the back of the machine with a starting switch and control lever on the side. The driving motor is fully guarded by means of a metal frame and wire screen, as illustrated.

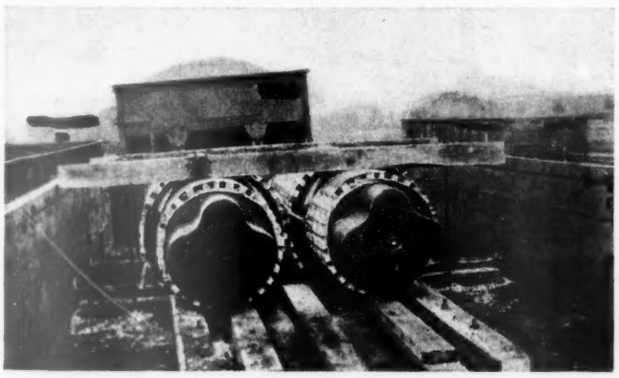
The table top is approximately 32 in. by 43 in., and located at a convenient height of about 36 in. above the shop floor. Two metal slides inset in the table top, as

illustrated, serve as guides for a wood carriage which moves at right angles to the saw cut and is equipped with a simple wood vise, operated by a screw and hand wheel. The machine is designed to cut either copper or aluminum tubing in all sizes up to 2 in., and the operation consists simply of placing the tubing in the hand-clamp or vise and feeding it by hand to the cut-off saw which makes the cut smoothly and easily.

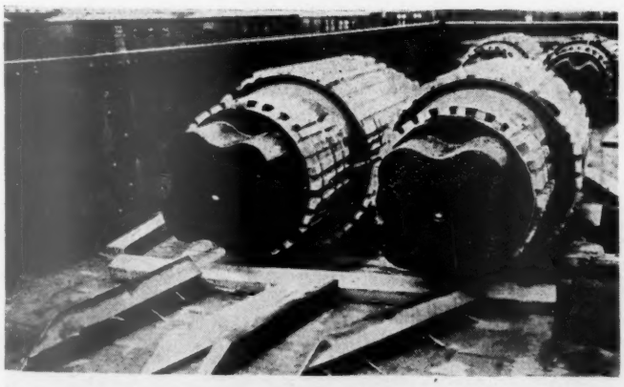
In practice it was found necessary to furnish protection against flying chips; consequently, the hinged metal guard, shown in the illustration, was applied in such a way that while making the cut it is turned down over the saw groove and deflects or catches all chips. As in the case of the other machine, the advantage of this one is that the saw cut is made quickly, square with the pipe centerline and with practically no fin.

Inspection of Lading In Open-Top Cars

One of the most important duties of a car inspector is to inspect carefully the lading placed in open-top cars before it is allowed to leave despatching terminals to see that it is securely braced to prevent shifting of the load while in transit. The blocking used to secure the lading should be checked to see that it conforms to the minimum requirements specified in the A. A. R. Loading Rules, and where there is no specific rule or figure in the rules to cover a specific type of lading the inspector should, if possible, call the matter to the attention of his foreman



Twin rolls loaded in accordance with Sketch 1 of Fig. 65-A of the loading rules—Note exceptionally long bodies tied down in accordance with Sketch 2—With ordinary train handling this load will stay in position



Two rolls that were loaded in the center of the car, their combined weight being in excess of 20,000 lb. but not in accordance with Sketch 1 of Fig. 65-A—Note Item *B* split and broken and Items *C* torn loose

Minimum Requirements for Securing Mill Rolls, Lengthwise-Gondola Cars*

Item	No. of Pieces	Description
A	.....	Brake wheel clearance. See Fig. 2 of the Loading Rules.
B	2	4-in. by 4-in., hardwood, length to suit, rolls less than 20,000 lb. 4-in. by 6-in., hardwood, length to suit, rolls 20,000 lb. and over. Secure each Item *B* with 2 bolts, ¾-in. diameter with washers, through floor and Items *F*. When Items *B* are less than 3 in. thick, they must completely fill space between the shoulders of rolls and Items *G*. See sketch 1.
C	6 per roll	4-in. by 4-in., hardwood, wedge shaped, rolls less than 20,000 lb. Secure each with five 40-D nails. 4-in. by 6-in., hardwood, rolls 20,000 lb. and over. Secure each with 2 bolts, ¾-in. diameter, with washers, through floor and Items *F*. Increase length of center item, when necessary, to admit of applying nails or bolts. When Items *G* are used, Items *C* and *G* must be of equal height. See sketch 1.
D	2 per roll	4-in. by 4-in., hardwood, rolls 28-in. diameter or less. For rolls over 28-in. diameter, height of Items *D* must be one-seventh the diameter of roll, maximum height 10 in., width equal to height, length equal to two-thirds the length of body of roll. Secure to floor with 40-D nails.
E	Each Item *D* 6 ft. long or less, 3. Each Item *D* over 6 ft., add 1 for each additional 4 ft. or less in length. Rolls weighing 20,000 lb. or over, 2 each, Item *D*.	4-in. by 4-in. by 12-in., hardwood, wedge shaped. Secure with 40-D nails. Two-thirds of Items *D*, minimum thickness 2 in., 4 in. wide, hardwood. When applied in two or more sections, bottom section must be long enough to fill space between Items *D* and car sides, nailed to floor with 30-D nails. Nail top sections to the one below with 30-D nails.
F	6 per roll	2-in. by 4-in. by 18-in., or ⅜-in. by 4-in. by 6-in.

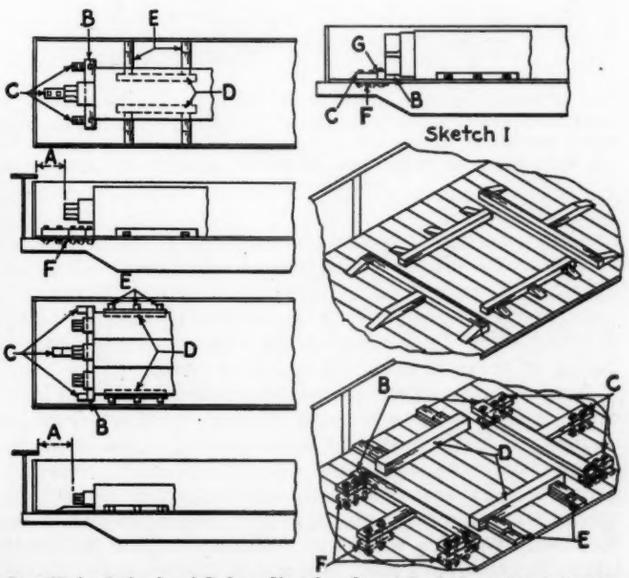


Fig. 65-A of the Load Rules—Sketches 2 and 3 of the original drawing are omitted

G	2 per roll	6 in. wide, high enough to provide 4-in. bearing against end of roll, hardwood, length to suit. Secure each with 2 bolts, ¾-in. diameter with washers, through floor and Items *F*. Required only when Items *B* are less than 3 in. thick. See sketch 1.

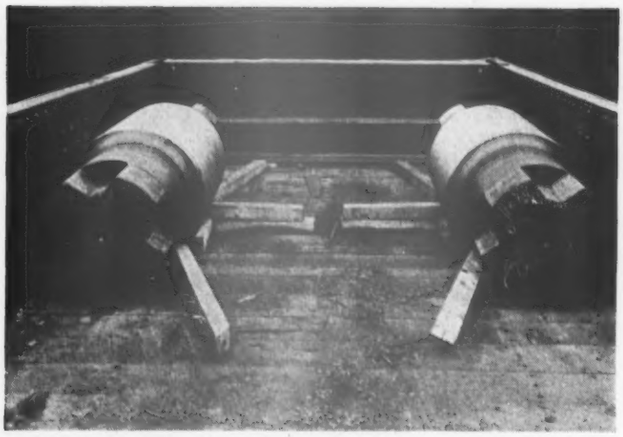
When loaded two or more, side by side, and their combined weight is 20,000 lb. or more, Items *B* and *C* must be bolted. Items *D* and *E* required only on sides of rolls next to car sides.

Rolls with short bodies, 24 in. diameter and over, and exceptionally long bearings, must be secured as per either sketches 2 or 3 in Fig. 65-A of the Loading Rules.

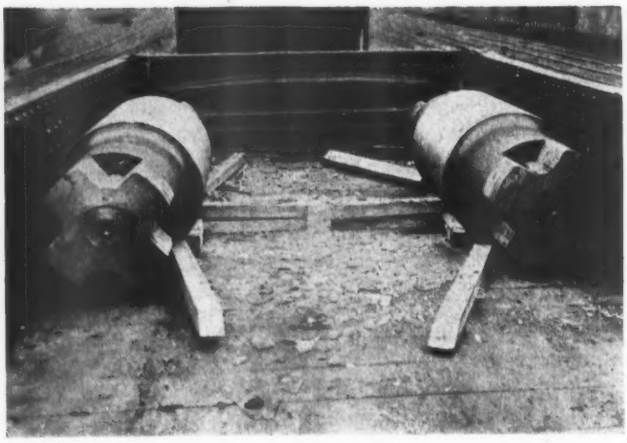
Finished portions of rolls or bearings must be protected to prevent damage.

See General Rules for further details.

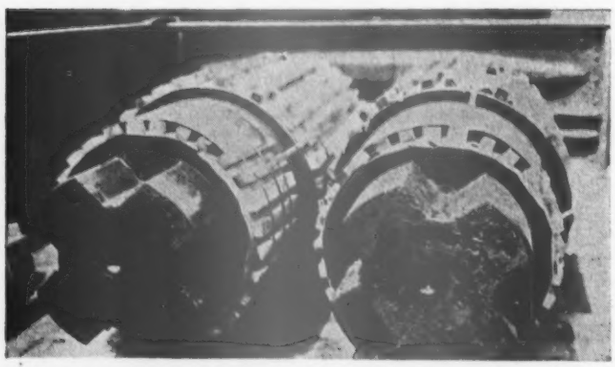
* All items and sketches mentioned in this table are shown in Fig. 65-A of the A. A. R. rules governing the loading of commodities on open-top cars, page 154 of 1937 revised edition, effective January 1, 1938.



End blocking which should have been applied in accordance with Sketch 1 has been torn loose; obviously, one or both rolls will work past the side blocking and shift toward one side of the car on a curve



The combined weight of these rolls is in excess of 20,000 lb. and they should have been loaded in the center of the car in accordance with Sketch 1 of Fig. 65-A of the Loading Rules



Two rolls weighing eight tons each with no end protection and only a small block slipped under each side of the rolls to prevent them from rolling toward the car side—If they had shifted against the side of the car they would no doubt have caused an accident by derailing or upsetting the car

This is a good looking load; however, it will not meet the requirements of Fig. 65-A of the Loading Rules because one Item *C* is required directly in the center of each roll. This is important because the end thrust of each roll is confined to this point and, unless protected, Item *B* will split allowing the load to become loose

so that a careful study can be made of the load. If no foreman is available he should not permit the load to depart in a train until he is firmly convinced that sufficient bracing and blocking has been provided to carry the load safely to its destination without damage to the lading or creating a hazard to the railroad.

A commodity that requires the greatest of care in handling is mill rolls, which range from 6 in. to 6 ft. in diameter. Modern rolling mills erected in many parts of the country have brought about the demand for larger diameter rolls, some of which weigh as much as 20 tons apiece. The requirements of former Fig. 65 of the A. A. R. Loading Rules were not sufficient to prevent these large-diameter rolls from shifting in transit with the result that several loads that had been secured in accordance with this rule were found shifted past their side blocking. Fig. 65-A was then developed and shows the minimum requirements for securing these rolls to prevent them shifting in transit, rolling over against the car sides and creating a hazard that is liable to cause the car to derail or turn over.

The accompanying illustrations show several cases where mill rolls were improperly blocked and where the requirements of Fig. 65-A of the loading rules were not followed at the place where the cars were loaded, making it necessary for the car inspector to bad-order the car and have the loads reblocked before allowing them to continue to their destination. While none of the rolls in the illustrations were damaged or caused an accident, this was no doubt prevented by the action of the car inspector in bad-ordering the cars before they actually shifted sufficiently to pass by the side blocking and roll towards one side of the car.

By carefully comparing the manner in which each of the illustrated loads were loaded with the reproduction of Fig. 65-A of the A. A. R. Loading Rules it will be observed that in only one case was the minimum requirements of the rules followed.

Decisions of Arbitration Cases

(The Arbitration Committee of the A. A. R. Mechanical Division is called upon to render decisions on a large number of questions and controversies which are submitted from time to time. As these matters are of interest not only to railroad officers but also to car inspectors and others, the Railway Mechanical Engineer will print abstracts of decisions as rendered.)

Disagreement as to Type Of Brake Beam Applied

On July 29, 1936, the Green Bay and Western repaired NATX car 1416 and in its bill showed that one new No. 15 A. A. R. brake beam had been applied. On

August 4, 1936, the Chicago, Milwaukee, St. Paul and Pacific removed the brake beam and in its repair card showed it to be an A. A. R. No. 2-plus beam.

The North American Car Corporation maintained that the repair card of the C. M. St. P. & P. acted as joint evidence, according to Rule 90, that a No. 15 beam had not been applied by the G. B. & W., and asked that the latter road reduce its charge to that for a secondhand No. 2-plus beam. However, the G. B. & W. contended that a new No. 15 had been applied on its lines and maintained that it had never been the purpose of joint evidence to prove that secondhand material had been applied, the purpose being to show that repairs might have been made which are not the owner's standard.

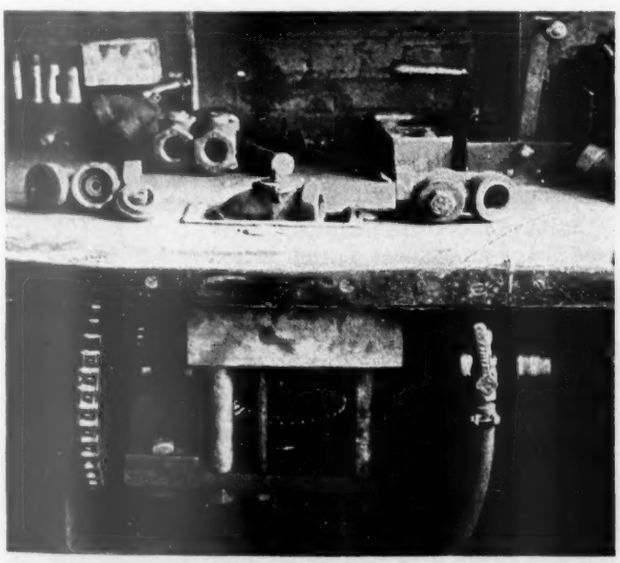
In rendering a decision on November 11, 1937, the Arbitration Committee stated: "While this is not a case of wrong repairs, the principle of Rule 90 applies, and the bill of the Green Bay and Western should be adjusted to a basis of a new No. 2-plus beam applied."—*Case No. 1759, North American Car Corporation versus Green Bay & Western.*

Angle Cock Cap Remover

Many of the angle cocks received at car shops for repairs have caps corroded or damaged, making their removal difficult, and considerable time is sometimes required in doing this work by hand. The mechanical cap remover, illustrated, was developed to overcome this trouble and has proven unusually efficient, removing all caps without trouble.

To remove the cap, the cock is placed, cap down, in a slot in the bench top. The hex nut on the cap will then be in a power-driven hex socket, located beneath the slot which holds the cock while the cap is being turned out. The device operates at slow speed so that the cocks can be placed in and removed from the machine while it is in motion; six caps per minute can be removed.

The device is powered from an overhead shaft through a combination of pulley, cone clutch, sprockets and gears to a vertical shaft on which is mounted a hex socket of size suitable for the work. The hex socket is located in the center of the slot and three inches below the bench top. The slot in the bench top is metal lined. Operation of the machine is controlled by a lever conveniently located on top of and to the rear of the bench and connected to the cone clutch.



Angle cock cap removing device used at the Northern Pacific shops, Brainerd, Minn.

Discussion of I. C. C. Rule 4*

M. E. Fitzgerald, general car inspector, C. & E. I.: There is quite a misunderstanding on the part of inspectors in connection with Rule 4. I have in mind the question of one stake on a car raked to destruction, the rule providing that two stakes on a car raked one-third of its depth are cardable. I understood Mr. Mehan to say at the last meeting that the association will put out an interpretation on that rule. We are really up against a problem on cars moving through interchange with one stake on a car raked to destruction, cut in two. I would like Mr. Mehan, if he would, to give us some idea as to what to do when we receive a car with one stake raked practically to destruction.

J. E. Mehan, assistant to superintendent car department, C. M. St. P. & P.: As I understand this rule, one stake or one brace on one side of a car damaged to destruction would not be cardable. That's the way I understand it. There must be two stakes damaged to the extent shown before it is cardable. Bear in mind that this limit of cardable defects in Rule 4 for open top cars was brought about by a study made where this sub-committee viewed hundreds of open-top metal cars, and it was really surprising to see the cars that came out from the owner's shop after having had the air brakes cleaned, or the boxes repacked, or the car repainted by the car owner. In other words, work done on the car that could only be done on a repair track and he allowed these cars to return to service with these posts in this condition, and it was from what the committee saw that this rule was framed. If the car owner didn't pay any attention to these defects why should you; if he didn't consider it detrimental enough to repair when he had the opportunity to do so, why should you; and it was on that basis that this limit was defined. There were cars with bulb stakes flattened right up against the side of the car just as though there never had been a bulb in it at all; still the car was repainted all over and nothing was done to straighten the stakes. The car owner didn't seem to mind as long as there were less than three so damaged or even cut, so I would say, from the reading of the rule, that where one post or one brace on the side of the car was damaged to destruction, or even missing entirely, it would not be cardable.

Mr. Fitzgerald: Every car foreman knows what Mr. Mehan has said is true. We write these rules and the rule is clear. It is true that thousands of cars are moving with one and two stakes flattened and the owners run them. The association, which merely represents the railroads in making and formulating these rules, writes a rule to which the president of the railroad has agreed, so why should we worry about them; why shouldn't we be honest and not have this difference of opinion at every terminal? Let's go along with what Mr. Mehan has said. There is quite a bit of discussion of this question throughout the country and you men can go a long way towards cutting out a lot of this useless carding. On the railroad I represent we are in a position to follow

* Abstract of a Discussion at the February Meeting of the Car Foremen's Association of Chicago.

up every defect card that's issued. I can bring you any number of defect cards for side stakes raked and damaged that have never been billed and never will be. We have followed them up for two or three years and I can produce a great many of them any time you want. The committee is doing a big job and is trying to help our inspectors. At large points, such as Chicago, the inspectors pass cars up in a hurry, but at the smaller points where the inspectors have more time they card these things and criticise the fellow in Chicago for not carding them. Let's cut out that foolishness. I think the committee is on the right ground when they cut out a lot of this useless carding.

Mr. Mehan: Perhaps the committee that is to recommend changes at the next meeting might ask that some interpretation be put in Rule 4 to amplify it in such a way as to make it clear if it is not clear. The A. A. R. has gone to great lengths in trying to make Rule 4 workable. As you all know, it is necessary that we have Rule 4 because of the trivial unfair usage defects that are really not detrimental to the car and are not repaired until the car is shopped for general overhauling. In the meantime, the car remains in service with a defect card on it. It becomes so illegible that nobody can read it, or it is lost off and the wrong railroad is finally penalized. Every inspector at interchange points is supposed to take a record of that defect card, and so we have to put something in Rule 4 to define the defects which would not be cardable in order to cut out this unnecessary defect carding and recording. It has worked very well, but it is a hard rule to write and make it satisfactory to everybody. No matter how you define limits you will always find questions of the kind Mr. Fitzgerald raises, and, of course, we cannot say that they are foolish questions. I think it would be better if we would petition the A. A. R. to give us some kind of a ruling in Rule 4 to define whether or not a post or brace damaged to destruction or missing entirely would be cardable so that that question would be settled forever.

J. Krupka, general foreman, C. B. & Q.: If we have a car with one post out and one post bent to the extent shown in Rule 4, would one or two posts be cardable?

Mr. Mehan: One post cut and one post bent on the same side of the car? If the post that's bent isn't bent to the extent defined in Rule 4 we don't care if the owner ever repairs it or not because it will never be cardable in interchange. If the post that's cut isn't cut to the extent shown and there is only one of them, it isn't cardable because it doesn't require any carding in interchange so that you and I will never be bothered with carding for two posts of that kind.

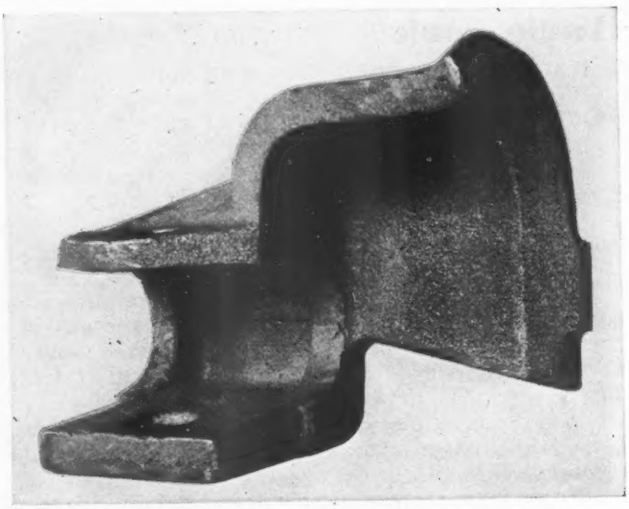
Mr. Krupka: The question was, one post is bent to the extent shown and other post is cut to the extent shown.

Mr. Mehan: Under the rule, the one that is bent to the extent shown is cardable, the other would not be. That would be my interpretation of the rule.

Mr. M. E. Fitzgerald: I quite agree with Mr. Mehan. We must, as car men, get away from this theory of technical interpretation and technical exceptions. If we can ever get to the point where we agree that the committee appointed to formulate these rules actually represent the roads, and then if you will turn to the page in the rule books where you will note your president accepted the position of the committee formulating these rules, then we can come to a common understanding and there won't be a condition such as confronts us now. Transportation men invariably tell me that no two car men agree on the rules. We have got to get to a point where these men accept the position of the committee. What's the use of you and me arguing when the president signs the book of rules and in that book he says that two stakes must be raked to a certain extent. I am not trying to force my personal opinions on you, I am trying to get all car men to agree that one thought, one idea, right or wrong, is the thing we ought to follow. In other words, if it is wrong let's follow the thought of the committee for one year. Better that than having a thousand diversified ideas of the rule. The rule to me is clear. I brought it up so that Mr. Mehan could interpret it and we would all have one thought on the matter and so this association can back it up.

Replacement Brake Hanger Bracket

Cast-steel U-section truck side frames which are equipped with obsolete or worn brake-hanger brackets can now be modernized by cutting off the old brackets and welding on the new replacement bracket, illustrated, which



Replacement brake-hanger bracket before application to the truck side frame

has been developed especially for this purpose by the Illinois Railway Equipment Company, Chicago. The application is made by burning the old bracket from the truck frame with an acetylene torch approximately 3 in. from the centerline of the hanger, leaving a portion of the old bracket to which the new bracket may be welded by the electric-arc method. The new bracket is made of electric cast steel.

The hanger bearing portion of the replacement bracket is made in accordance with the latest A. A. R. 1937 design. The attachment portion is designed to replace any type of bracket now on the frame. The new replacement bracket is placed in the standard A. A. R. hanger location regardless of where the present brackets are located. This permits the use of a standard loop-type hanger instead of necessitating the use of several different designs and lengths of hangers.

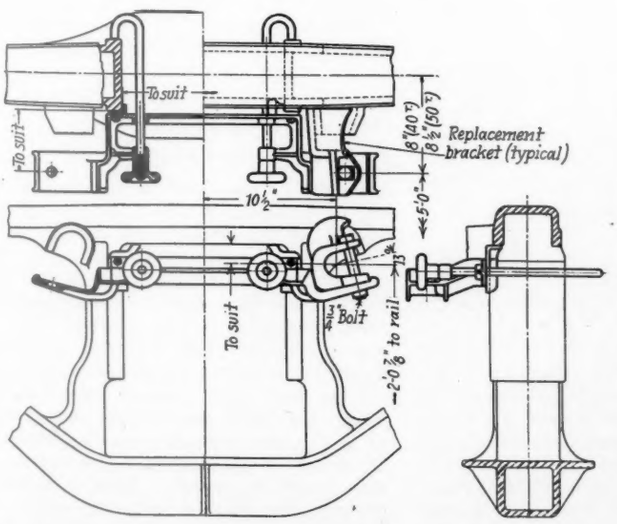
Correct alinement of the replacement bracket is controlled by a jig, furnished by the manufacturer and used as shown in the drawing. The location of the bracket is gaged from the side-frame column opening, and variation in the side-frame column opening in relation to the brackets is taken care of by an adjustable stop gage on the jig. The jig is clamped to the side-frame column as shown; the bracket is then placed in the outstanding

View of the bracket welded to the side frame and equipped with Mobile Type-A brake-hanger bearings and Perfection retainer key

arms of the jig, and the brackets are tack welded, after which the jig is removed and the welding completed.

The operation of burning off the old bracket and applying the new bracket consumes little time and can be accomplished with ordinary shop facilities.

Mobile Type-A brake hanger retainers are used in the



Assembly drawing which shows how the brake hanger bracket welding jig is applied and used

brackets to provide hanger bearings, and also to remove all wear from the side-frame brackets. The retainers are reversible and are normally held in position by Perfection retainer keys, a new improvement over the bolt-holding means previously used for securing the retainers in position. The tapered key serves as a drift to force the retainers back into the bracket, and, together with the key adapter, completely fills the holes in the bracket. The key is of ductile drop-forged steel, is readily bent in locked position, and can be removed and reapplied many times.

Questions and Answers On the AB Brake

Brake Cylinders (Continued)

304—*Q.—What test should follow the application test?* A.—The brake-pipe leakage test.

305—*Q.—How is this test made?* A.—Make a further brake-pipe reduction of 15 lb., and move the device handle to lap position.

306—*Q.—What then should be observed?* A.—The pressure on the brake-pipe gage, leakage being indicated by a drop in pressure.

307—*Q.—What leakage is permissible?* A.—The drop should not exceed 2 lb. in 1 min.

308—*Q.—What action is noticeable during this test?* A.—A slight pumping action of the emergency piston, indicated at the quick-action exhaust.

309—*Q.—Does this affect the leakage test?* A.—It will in no way affect this test.

310—*Q.—What test follows the brake-pipe leakage test?* A.—The auxiliary-reservoir leakage test.

311—*Q.—How is this test made?* A.—Watch the brake for 1 min. If a release is obtained in less time, it indicates leakage of auxiliary-reservoir pressure.

312—*Q.—To what may such leakage be attributed?* A.—To a leaky graduating valve, slide valve, auxiliary reservoir or pipe connections.

313—*Q.—What defect in the test device would bring about a release?* A.—A leak into the brake pipe past the rotary valve.

314.—*Q.—What test should follow the auxiliary-reservoir leakage test?* A.—The release test.

315—*Q.—How is this test made?* A.—By moving the test-device handle to the No. 2 position.

316—*Q.—What effect does this have?* A.—It increases the brake-pipe pressure through a restricted opening in the test-device rotary sufficiently to force the piston and slide valve to release position.

317—*Q.—What time should be required to accomplish the release?* A.—On cars whose length is 50 ft. or less, 20 sec., plus 5 sec. for each pound of brake-pipe leakage. On cars 51 to 60 ft. in length, 25 sec. plus 10 sec. for each pound of brake-pipe leakage. On cars 61 to 70 ft. in length, 30 sec. plus 15 sec. for each pound of brake-pipe leakage.

318—*Q.—What precaution should be taken during this test?* A.—It must be observed that the supply-line pressure does not drop below 70 lb.

319—*Q.—In the event of any such variation, what should be done?* A.—Means should be provided for maintaining the supply pressure at 70 lbs. and the test repeated.

320—*Q.—What test follows the release test?* A.—The service stability test.

321—*Q.—What must be done before beginning the test?* A.—Move the device handle to position No. 1, charging the brake pipe and reservoirs to 70 lb.

322—*Q.—When the system is fully charged, how is the test conducted?* A.—Move the device handle to position No. 5, reducing the brake-pipe pressure 20 lb. and then return to lap position.

High Spots in
Railway Affairs . . .

Eastern Railroads Get Passenger Fare Increase

On July 5, the Interstate Commerce Commission reversed its 6-to-5 decision of last April and authorized the eastern railroads to increase their basic coach fares from 2 cents per mile to 2.5 cents a mile for an experimental period of 18 months. This readjustment, which was made in the midst of the vacation season, naturally caused all sorts of repercussions. The fact that the railroads need greater revenues is, of course, not questioned. The fear on the part of some of the commissioners is that this increase in rates will drive business to competing carriers and will result in less net for the railroads than if the 2-cent-fare had been maintained. The question arises, however, whether such a determination is not purely a managerial function which should be made by the railroad managements which are thoroughly familiar with the passenger business, and which must carry the responsibility for the results, rather than by the commissioners who are more or less far removed from the practical problems involved. The Commission also emphasizes the point that coach service has been greatly improved since its decision in 1936 that coach fares should not exceed 2 cents a mile. Heavy investments have been made in these improvements, and this fact is recognized and appreciated, even by casual travelers.

"Road Hogs"

Railroad brotherhood magazines in recent years have contained complaints from some of their members about the "road hogs;" that is, men, who because of their seniority and the peculiar rules under which they operate, have been able to make unusually large wages at the same time that men down the list have been furloughed or have worked for only a small part of the time. It is a matter of record that some of these "road hogs" are paid for as high as 40 days or more of work in a month. Interestingly enough, this phase of the wage question promises to be integrated into the present wage controversy, but not by the railroads or by the labor leaders. It is coming rather from railroad economists, the newspapers and the railway press. The furloughed men and those working on short time have lacked leadership in protecting their interests, but are rallying as they recognize that outside influences are sympathetic to their needs. With the limelights focusing upon unfair and punitive working rules, which cause the railroads to spend millions of dollars each year for work not done, it looks as if there might be an overhauling of the working agreements which were adopted at a time when operating conditions were very different from what they are today. It is high time that they were revised to conform to modern operating conditions. If so, then money, which is now being spent for work which is not done, can be diverted to productive work which will call back to their jobs many workers in the equipment and road maintenance departments. There is plenty of such work which must be done if the funds can be found.

Will the Rutland Follow the Circus?

The roustabouts put the circus out of business, even though the performers were willing and anxious to take a cut in their salaries to keep it going. What will happen on the Rutland? The federal judge has said that the court could not permit the receiver to operate that railroad many days at a loss of $2,400 a day. Officers of the 413-mile road have accepted successive salary slashes since May 5, totaling about 56 per cent. Citizens in communities along the line are naturally greatly disturbed over the prospects of abandonment, and are seeking to find ways and means of keeping the road in operation. The suggestion has been made that, in conjunction with various other measures, a voluntary wage cut on behalf of the employees would help to insure the operation of the road for a time at least. Doubtless, the workers would be glad to make a reasonable compromise to protect their jobs. The labor union spokesman, however, insists that such proposals can be discussed only under the provisions of the Railway Labor Act, proceedings for which are already under way, which may stretch out over several months. As a result the workers on the Rutland may soon find themselves entirely off the payroll.

Deadheads

The passenger traffic report made by Coordinator Eastman's Section of Transportation Service in 1935 estimated that passenger transportation issued gratis annually was equivalent to at least 50 million dollars. In the following year, a compilation made by the Bureau of Statistics of the Interstate Commerce Commission, and covering the first quarter of 1936, indicated that by far the largest percentage of those receiving free transportation were employees, or members of their families, of the carrier reporting. A recent report of the same Bureau, covering the year 1937, estimates that free transportation to the value of almost 25 million dollars was given to the employees of other carriers and their families and to persons not employees of carriers nor members of employees families. Obviously, the discontinuance of passes to employees of other carriers or to non-employees would not save the railroads this amount of money. The report is presented as a matter of information without recommendations.

The Wage Controversy

The Brotherhood of Railroad Trainmen broke away from the Railway Labor Executives Association some time ago, and is now holding separate conferences with the Carriers Joint Conference Committee in the negotiations on the proposal to reduce wages 15 per cent. The American Train Dispatchers Association and the Order of Sleeping Car Conductors are not participating, since they were not served notices of a reduction on July 20. There is apparently no possibility of agreement between the leaders of the workers and the managements, and the next step will be to appeal for mediation. Just when this may be done was not evident when this was written. The labor leaders apparently intend to do all they can to slow up the progress of the controversy, in the hope that improved business conditions may help their case when it is finally settled. Unless something unforeseen occurs, the controversy promises to drag along for several months. That all of the workers are not in sympathy with the steps their leaders are taking is quite apparent. It would be interesting, also, if some unbiased public authority would judicially pass upon the correctness of the absurd statements that are now being made for public consumption, and quite apparently, for propaganda purposes.

Railway Mail Service Passes Century Mark

On July 7, 1838, Congress approved of an act designating every railroad in the United Sates as a post route. Before that time the railroads had carried mail for contractors who transferred it from stage coaches and other agencies because of the more expeditious service offered by the new competitor. July 7 of this year was, therefore, observed as the centenary of railway mail service on an official basis. There has been considerable controversy as to the time and place of the first use of railway mail cars on which the mail was sorted in transit. Two mail cars, equipped for sorting mail, were built by the Hannibal & St. Joseph (now a part of the Burlington lines) in 1862, and these cars were placed in service on July 26 of that year, operating between West Quincy across the state of Missouri to St. Joseph. Similar service was inaugurated on the Chicago & North Western, between Chicago and Clinton, Iowa, on August 28, 1864. Apparently, mail was sorted on trains considerably earlier than these two dates, envelopes being in existence post marked on the Boston & Albany in 1857.

Among the Clubs and Associations

Eastern Car Foremen's Outing

THE Eastern Car Foremen's Association held its annual golf tournament and field day at the Racebrook Country Club, New Haven, Conn., on Thursday, July 14. Railroad and supply men from the eastern and New England districts made up the total attendance of about 275 members and guests. Numerous events were held to provide entertainment for those in attendance. The golf tournament, as usual, held the spotlight with seven prizes for the principal winners. These were as follows: Low gross, Harry Nunn, B. & A.; Class A—Low gross, T. M. Ferguson, American Arch Company; low net, C. E. Bryant, Jr., Johns-Manville Corporation. Class B—low gross, L. C. Haigh, Magor Car Corporation; low net, E. L. Brown, B. & O. Class C—low gross, W. P. Brennan, Fabreeka Products Company; low net, W. L. Giles, Ellcon Company. In the putting contest for golfers G. W. Rink, Reading, was the winner and in the putting contest for non-golfers first prize was won by C. A. Hillers, L. C. Chase Company. The general arrangements for the outing were carried out under the direction of J. P. Egan, president of the association; F. H. Becherer, general chairman; A. E. Calkins and R. Sonquist, vice chairman, and 11 committee chairmen.

Mechanical Conventions

THE Committee on Co-ordination of Mechanical Conventions met at the Hotel Sherman, Chicago, Monday, July 25, F. P. Roesch presiding. The following associations were represented: Car Department Officers, International Railway General Foremen, International Railway Master Blacksmiths, Master Boiler Makers, Railway Fuel and Traveling Engineers and Allied Railway Supply Association. In accordance with recommendations made by the General Committee of the Mechanical Division, A. A. R., it was decided that no conventions of these associations be held this year. In order, however, to avoid any break in the continuity of the proceedings and the committee reports and to maintain them up-to-date, it was decided that open business meetings of the officers and committees of the various associations represented be held at the Hotel Sherman on Tuesday, September 27, and if necessary the meetings be continued over Wednesday, the 28th. Some of the associations have so many reports to discuss that it will be difficult to dispose of them, even in the two-day period.

Announcement was also made at the meeting that the American Railway Tool Foremen's Association will unite with the International Railway General Foremen's Association. The suggestion was also made that efforts be made to revive the International Railway Master Blacksmith's Association, affiliating it with the International Railway General Foremen's Association.

American Welding Society Annual Meeting

THE annual meeting of the American Welding Society will be held at the Book-Cadillac Hotel, Detroit, Mich., October 16 to 21. The President's reception will be held on Sunday afternoon, October 16, while the technical sessions will begin at 9:30 a. m., Monday, October 17. The tentative program includes the following papers:

MONDAY, OCTOBER 17

Afternoon

Arc Welding as Influenced by Shop Preparation, Tools, Jigs and Fixtures, by M. S. Evans, American Car & Foundry Company

Physical and Chemical Properties of the Nickel-Iron Alloys Formed in the Welding of Nickel Clad Steel, by W. G. Theisinger, Lukens Steel Co., J. H. Deppeler, Metal & Thermit Corp., and F. G. Flocke, International Nickel Co.

Weldability of Medium Carbon Steels, by R. W. Emerson, Westinghouse Electric & Manufacturing Co.

The Effect of Current, Pressure and Time on the Shear Strength and Structure of Spot Welds in the Aluminum Alloys, by G. O. Hoglund and G. S. Bernard, Jr., Aluminum Company of America

TUESDAY, OCTOBER 18

Morning

Flame Cutting, by J. J. Crowe, Air Reduction Sales Company

Weld Penetration, by John Hruska, chief metallurgist, Electro-Motive Corp.

Bronze-Welding, by W. S. Walker, The Linde Air Products Company

Some Electrical Charactersitics of Arc, by Dr. C. G. Suits, Research Laboratory, General Electric Company

Afternoon

(Joint Session with American Society of Mechanical Engineers)

Brazing Tubes in High-Pressure Boilers with Silver Alloys, by A. W. Weir, New York Central, and H. M. Webber, General Electric Company

WEDNESDAY, OCTOBER 19

Morning

Recent Developments in Welding of Machine Tool Structures, by L. F. Nenninger, chief engineer, and W. A. Maddox, welding supervisor, The Cincinnati Milling Machine Company

Symposium on Copper Alloy Welding

Progress in Copper Welding, by Ira T. Hook, research engineer, and Clinton E. Swift, welding engineer, American Brass Company

Testing of Spot Welds on Copper-Base Alloys, by D. K. Crampton, M. L. Wood, and J. C. Babin, Chase Brass and Copper Co.

Carbon Arc Welding of Silicon Bronze, by E. S. Bunn and J. R. Hunter, Revere Copper and Brass, Inc.

A Quick Shop Test for Quality of Weld and Its Correlation with the Standard Tests, by W. J. Conley, The University of Rochester

FRIDAY, OCTOBER 21

Morning

Railroad Session

Welding in Car Construction, by A. M. Unger, Pullman-Standard Car Manufacturing Company

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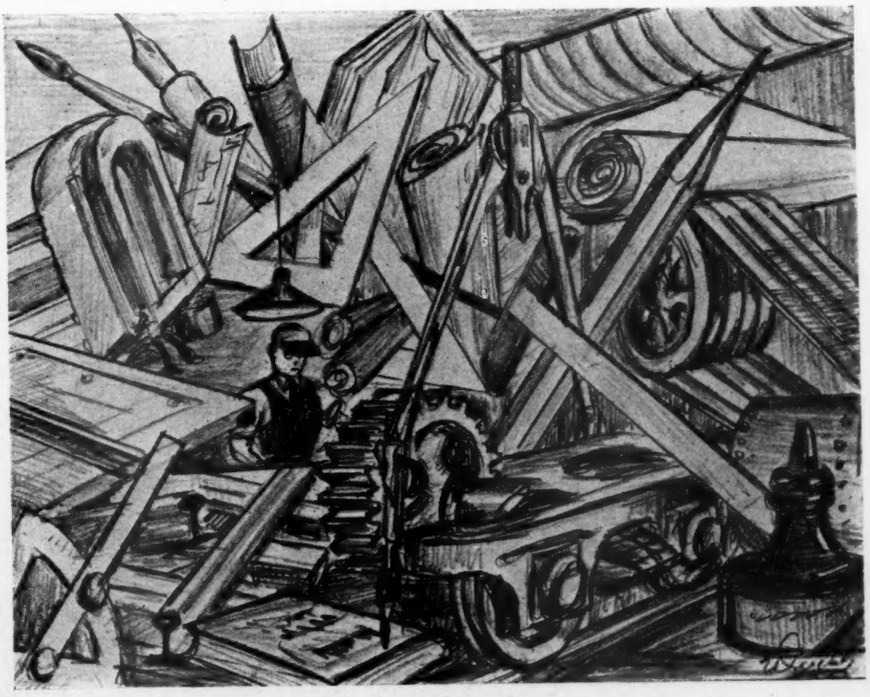

The Draftsman's Dream

"The Drawing Office During a Passenger-Car Program," by Fred Wiegratz, draftsman, C. M. St. P. & P., Milwaukee, Wis.

*The "Flying Scotsman" trains of the London & North Eastern at Stevenage, England**

NEWS

C. M. & St. P. Enlarging Enginehouse at St. Paul

THE Chicago, Milwaukee, St. Paul & Pacific has awarded a contract to the Okes Construction Company, Minneapolis, Minn., for the construction of a 30-ft. addition to three stalls of this company's enginehouse at St. Paul, Minn., consisting of new concrete pits, brick walls on pile foundation and a frame roof. The total cost of this work will be approximately $30,000.

A. S. M. E. Committee on Rubber and Plastics

A committee on rubber and plastics has been established by the Process Industries Division of the American Society of Mechanical Engineers which will deal with several phases of these industries, including mechanical applications, research on basic mechanical properties, processing equipment, and standards. Activities of the group will be beyond the normal range of other professional organizations in an effort to fill the present conspicuous gap in the mechanical field.

The committee will sponsor the presentation of papers at technical sessions of the regular national meetings of the A. S. M. E. Dr. F. L. Yerzley, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., is chairman of the rubber and plastics committee. The secretary is Dr. J. F. Smith of the Edward G. Budd Manufacturing Company, Philadelphia, Pa.

C. N. R. to Spend $14,000,000 for New Equipment

THE Canadian National will make new equipment purchases amounting to nearly $14,000,000 during the present year, according to J. L. Ilsley, acting Finance Minister at Ottawa. Of this amount a loan of $3,455,000 has been authorized by the House, the remaining three-quarters of the total to be raised by the railroad under powers granted by legislation passed some years ago.

G M C Exhibit at World's Fair to Include Diesels

A LARGE section of the General Motors Corporation exhibit at the New York World's Fair of 1939 will be devoted to Diesel-engine operations. In this connection, a complete 3,600-hp. streamlined Diesel-electric locomotive will be displayed for visitors to inspect. The field of transportation as a whole will be reviewed through scientific and educational exhibits sponsored by General Motors Research Laboratories, which will illustrate the contributions and achievements of research in transportation during the past 25 years.

B. & O. and Pullman to Streamline Capitol Limited

THE Baltimore & Ohio has concluded arrangements with the Pullman Company for the streamlining of the Capitol Limited, the roads all-Pullman train operating between Washington, D. C., and Chicago. The work will be started immediately, one set of the train's equipment being put through the shops first, to be followed by the other set as the first Capitol streamliner goes into service. Delivery of the first set is expected in the early fall.

The improved Capitol will follow the now-standard B. & O. pattern of streamlining, devised by Otto Kuhler, consulting engineer of design.

Awarded Honorary Degrees

L. W. BALDWIN, president of the Missouri Pacific, Edward M. Durham, Jr., chief executive officer of the Chicago, Rock Island & Pacific, and William C. Dickerman, president of the American Locomotive Company, classmates at Lehigh University in 1896, were awarded honorary degrees of Doctor of Engineering by that school at commencement exercises on June 14. The degree was conferred upon Mr. Baldwin in recognition of noteworthy contributions to the technique and economics of railway operation; upon Mr. Durham in recognition of noteworthy contributions to railway management; and upon Mr. Dickerman in recognition of notable contributions in the improvement of locomotive and other railway equipment. Messrs.

(*Continued on next left hand page*)

* To celebrate the jubilee of the railway race to Edinburgh in 1888 and the introduction of new rolling stock for the Flying Scotsman, the L. & N. E. on June 30 ran the original Flying Scotsman of 1888 from King's Cross to Stevenage, where the passengers were transferred to the new train. The locomotive of the former train, "The Stirling," having but one pair of driving wheels, was taken out of York Museum for the run, and the coaches were collected from all parts of the country.

Baldwin and Durham were graduated from Lehigh with a degree of civil engineer, while Mr. Dickerman was graduated with a degree of mechanical engineer.

Southern Pacific Car Workers Adopt Light Blue Uniforms

A LIGHT blue uniform with cap to match and with the name of the craft of the wearer inscribed upon it is now being worn by car inspectors, welders, coach cleaners, icemen, electricians, machinists, car oilers, boilermakers, carmen, truckmen, laborers, pipers, sheet metal workers and their helpers in Southern Pacific terminals. The innovation is a part of a general "spruce-up" campaign among employees whose work frequently brings them in contact with the public.

Petroleum Fair Exhibit to Feature Transportation Aids

How petroleum fuels and lubricants have aided in the maintenance of railroad service will be illustrated in a special display of the Petroleum Industry Exhibition at the New York World's Fair, 1939, which will feature the story of transportation from the ox-cart to the present day. The transportation exhibit will seek to show how the petroleum industry has aided railroading through the development of special oils and lubricants for locomotives, cars and other equipment and will indicate, further, how modern lubricants have freed engines and machinery from the limitations of friction at high speed.

The Petroleum Building at the fair will take the form of an equilateral triangle, covering an area of 28,166 sq. ft. Raised 20 ft. above the ground and rising to a height of 80 ft., the building will be supported by four large replicas of oil tanks.

Fourteen companies will participate in the petroleum exhibit.

"Coronation Scot" to Make American Tour

LORD Stamp of Shortlands, chairman of the London, Midland & Scottish (Great Britain), has announced that his road's streamline "Coronation Scot" will tour 3,120 miles over eight American systems next year, visiting 38 cities, and will later be exhibited at the New York World's Fair. Host to American transportation heads and other distinguished guests at a luncheon tendered by him in the Hotel Gotham, New York, as president of the Associated British & Irish Railways, Lord Stamp said that the London-to-Glasgow flier, which in trials set the British record speed of 114 m. p. h., will be brought here the last week in March to Baltimore, Md., where it will start on the following itinerary: Washington, D. C., Wilmington, Del., Philadelphia, Pa., Lancaster, Harrisburg, Pittsburgh, Wheeling, W. Va., Columbus, Ohio, Dayton, Cincinnati, Louisville, Ky., Indianapolis, Ind., Terre Haute, St. Louis, Mo., Springfield, Ill., Chicago, Kalamazoo, Mich., Battle Creek, Detroit, Toledo, Ohio, Cleveland, Akron, Youngstown, Erie, Pa., Buffalo, N. Y., Rochester, Syracuse, Utica, Schenectady, Albany, Springfield, Mass., Worcester, Boston, Providence, R. I., Hartford, Conn., New Haven and New York City.

In making this tour, the train will travel over the Baltimore & Ohio, Pennsylvania, Big Four, Louisville & Nashville, Illinois Central, Michigan Central, New York Central and the New York, New Haven & Hartford. The tour will end in time for the train to be in position at the World's Fair on April 15, ready for the opening on April 30. A post-exhibition tour is under consideration.

Twenty-Fifth Anniversary of the Railway Educational Bureau

A TESTIMONIAL dinner in celebration of the twenty-fifth anniversary of the Railway Educational Bureau was held on the evening of June 30 at the Union Station in Omaha, Neb., in honor of D. C. Buell, director. The Bureau was founded by E. H. Harriman of the Union Pacific System in 1909 and in 1913 D. C. Buell took over the operation as a private concern and offered the service to all railroad employees in the United States. Among the guests at the dinner were H. R. Safford, senior executive assistant of the Missouri Pacific, Houston, Texas; H. E. Dickinson, general superintendent, Chicago & North Western, Omaha, Neb., and Eugene McAuliffe, president of the Union Pacific Coal Company. The dinner was given and attended by all Bureau employees and their guests. Richard C. Buell, son of the founder of the Bureau, acted as toastmaster. He has been associated with the Bureau for the past four years as special representative and was recently made assistant to the director.

Evening Graduate Course at Stevens Institute

STEVENS Institute of Technology is offering for the first time during the academic year 1938-1939 a program of evening graduate courses. The program supplements the day graduate work which has been given for several years and, in its development, the faculty has considered the needs and interests of graduate engineers employed in the metropolitan area. Co-ordinated groups of related courses are offered in the fields of mechanical engineering, electrical engineering (specializing in communication), and economics of engineering.

With the exception of a few non-credit courses, each course carries credit in one or more approved programs leading to the degree of Master of Science. Although an essential qualification for this degree is graduation from a course in engineering or applied science, admission to graduate courses is open to those otherwise qualified.

Each evening graduate course is scheduled for one two-hour session per week for a semester of fifteen weeks and carries two and one-half credits. Thirty credits are the minimum requirements for the master's degree. Class sessions will ordinarily start at 6:30 p.m. and will be held at the Stevens Institute of Technology, Hoboken, N. J. The first semester will begin during the week of September 26, 1938.

Graduate instruction will be given by members of the Faculty of the institute; by Dr. F. B. Llewellyn of the Bell Telephone Laboratories, Inc., on vacuum tube electronics, and by Dr. David A. Cook of the Western Electric Company, Inc., on industrial psychology.

Inquiries and applications for registration should be addressed to Prof. Frank C. Stockwell, chairman, Committee on Graduate Instruction, Stevens Institute of Technology, Hoboken, N. J.

Employee Representation on the A. C. L.

THE services of the National Mediation Board were recently invoked by the Railway Employes' Department, American Federation of Labor, to settle a dispute as to whether the Brotherhood of Railway Carmen of America, operating through the Railway Employees' Department, A. F. of L., may properly represent carmen, their helpers and apprentices, in the employ of the Atlantic Coast Line.

The board assigned Mediator O. F. Carpenter to investigate and, after finding that a dispute existed among the employees in question, directed him to take a secret ballot to determine the choice of the employees, based on an eligible list agreed to by representatives of the contesting organizations. As a result of the election, in which 490 votes were cast for the Brotherhood; 397 for the A. C. L. Shopmen's Association, and four for other organizations or an individual, the National Mediation Board duly designated and authorized the Brotherhood of Railway Carmen of America, operating through the Railway Employees' Department, American Federation of Labor, to represent the craft or class of carmen, their helpers and apprentices, employees of the Atlantic Coast Line, for the purposes of the Railway Labor Act.

Reading Issues Large Posters of Equipment Photographs

BETTER to comply with numerous requests received each year for photographs of old railroad rolling stock and for picture series portraying the evolution of railroad transportation, the Reading has prepared a stock of large 22-in. by 28-in. white posters containing reprints of 23 photographs of prototypes of the various stages in a three-century march of transport and entitled "Progress in Transportation; 1638-1938." The earlier stages are brought out by old prints and paintings of sailing ships, horse caravans, canal packets and "Conestoga" freight wagons, while steam railroad development is illustrated by early Philadelphia, Pa., locomotives and interesting locomotive types operated by the Reading since its inception. Among the latter are included cuts of one of the early "camel-backs" and a high-speed "Atlantic" type of the class which hauled the early Atlantic City (N.

(Continued on next left hand page)

J.)-Camden "Sixty-Minute Expresses." Included also are photographs of present-day Reading equipment such as the streamline, stainless steel "Crusader," electric multiple-unit cars in Philadelphia suburban service, and a motor coach and freight truck of the Reading Central Transportation Company. A caption underlies each cut which explains in simple fashion the significance of the equipment illustrated and its place in the transportation set-up.

Welding of L- and T-Type Side Frames Prohibited

Upon instructions from the General Committee of the A. A. R. Mechanical Division, recommendations from the Arbitration Committee, concurred in by the Committee on Car Construction, to modify Interchange Rule 23 to prohibit welding of any description on L- and T-type side frames, also that Rules 3 and 19 should be modified to prohibit the application of L- and T-type side frames which have been welded to all interchange cars, were ordered submitted to letter ballot.

The vote on these recommendations was divided into three propositions which, as a result of favorable letter ballot, are now approved, effective January 1, 1939, and will be incorporated in the next supplement to the current Code of Interchange Rules as advance information.

Supply Trade Notes

THE AMERICAN BRAKE SHOE & FOUNDRY COMPANY of California has changed its name to The American Brake Shoe & Foundry Company, Pacific Coast Division.

◆

J. C. BLOOMFIELD, formerly western sales manager of the Link Belt Company, Chicago, has entered the railway supply business with offices at Room 608 McCormick Bldg., Chicago.

◆

S. L. POORMAN, assistant manager, at New York, of the Westinghouse Air Brake Company, has been promoted to eastern manager, with headquarters as formerly at New York. Mr. Poorman's engineering and commercial experience has extended over a period of 25 years, during which time he has served as test engineer,

S. L. Poorman

mechanical expert, representative and assistant manager. He has participated in the activities that have to do with the application of air brakes to all forms of railway transportation.

◆

J. B. TATE, for over 30 years in the operating and purchasing departments of the Pressed Steel Car Company, has been appointed general manager of the H. K. Porter Company, Pittsburgh, Pa.

◆

WILLIAM A. ROSS and A. L. BERLIN of the sales department of the Pyle-National Company, Chicago, have been appointed sales manager and assistant sales manager, respectively, with headquarters at the general offices and factory of the company at 1334 North Kostner avenue, Chicago.

◆

THAYER B. FARRINGTON has opened an office as consulting engineer at 308 Euclid avenue, Cleveland, Ohio. Mr. Farrington

T. B. Farrington

previously served as assistant works manager of the Pennsylvania at Altoona, Pa., and later was assistant general superintendent of motive power, with headquarters at Chicago. He then joined the B. F. Goodrich Company at Akron, Ohio.

◆

WILLIAM J. DALY, Detroit district sales manager of the Worthington Pump and Machinery Corporation, Harrison, N. J., has been transferred to the Philadelphia office, to succeed C. H. Shaw, deceased. He will be assisted by W. J. Van Vleck, recently appointed assistant manager in the Philadelphia district.

◆

H. C. DUGGAN has been placed in charge of sales and service of the Detroit Division of Oakite Products, Inc., New York, handling the work of J. A. Maguire, Detroit division manager, who is ill. Mr. Duggan's headquarters are in the General Motors building, Detroit. The New York and New England divisions of the company have also been consolidated into one unit, to be known hereafter as the Northeastern division. D. X. Clarin, New York division manager at New York, is in charge of the new division.

WILLIAM C. SIMPSON has been appointed manager of sales of the newly opened sales office of the Lukens Steel Company in the Gulf building, Pittsburgh, Pa. Mr. Simpson was born at Columbia, N. J. After graduating from the Belvidere, N. J., high school, he attended Blair Academy and Lehigh University, receiving the degree of bachelor of science in metallurgical engineering from the latter in 1932. Early in 1933 Mr. Simpson entered the employ of the Bethlehem Steel Company at Sparrows Point, Md. Since January, 1934, he has served the Lukens organization as research

W. C. Simpson

engineer in the metallurgical department, research metallurgist in the research department, and, since September, 1936, has been in the sales and sales development department.

◆

Obituary

J. ALEXANDER BROWN, vice-president and manager of the Railway Equipment and Publication Company, publishers of The Pocket List of Railroad Officials, Official Railway Equipment Register and Railway Line Clearances, died at Caldwell, N. J., on July 10. Mr. Brown was born in New York City on May 4, 1854. He first entered the publishing field with Poor's Publishing Company. He was manager of the Pocket List of Railroad Officials since that publication was established in 1895, and in 1909 was elected vice-president of the company which office he also held until

(Continued on next left hand page)

the time of his death. In 1905 Mr. Brown served as secretary and director of exhibits of the American Railway Appliance Ex-

J. Alexander Brown

hibition held in Washington, D. C., in connection with the International Railway Congress, and the U. S. Government appointed him a delegate to the International Railway Congress held in Berne, Switzerland, in 1910. Mr. Brown was one of the founders of the Railway Supply Manufacturers' Association and for many years served as one of the directors of that association.

F. A. LORENZ, JR., vice-president of the American Steel Foundries, Chicago, died in that city on July 23, after a long illness. Mr. Lorenz graduated from the University of Chicago in 1905 and received his master's degree in engineering from the University of Illinois in 1909. In the same year he entered the service of the Chicago & North Western as a special motive power apprentice at its Chicago shops. During 1910 and 1911 he was employed in various capacities by the Republic Iron and Steel Company at its East Chicago, Ind., plant. In the latter year he entered the employ of the American Steel Foundries as a wheel engineer and later became manager of sales of Davis wheels, assistant to the fourth vice-president in charge of operations and works manager of the Indiana Harbor works. In 1930 he was promoted to general manager of the Indiana Harbor and Pittsburgh works, in charge of sales and production. He was elected vice-president in 1934.

◆

OLIVER MURRAY EDWARDS, SR., founder and chairman of the board of The O. M. Edwards Company, Inc., Syracuse, N. Y., died suddenly from a heart attack at his summer home, Eagle Bay on Fourth Lake, Adirondack Mountains, N. Y., on July 2. Mr. Edwards was born at Ephrath, Fulton county, N. Y., on October 20, 1862. He attended elementary and intermediate schools in Johnstown, N. Y., and Johnstown Academy, and was graduated from the Boys' Academy, Albany, N. Y. Mr. Edwards' death ended a business career that began more than 50 years ago when, as a youth, just out of school, he first revealed an inventive ability which was the foundation of the railroad and office equipment manufacturing business that bore his name. One of his earliest devices was a

Oliver Murray Edwards, Sr.

design for window fixtures for railway cars which is still employed by the railroads. Another invention was an extension platform trapdoor which became standard railroad equipment. Other railroad devices followed.

Personal Mention

General

JOSE MARTINEZ CAMPOS has been appointed superintendent of motive power and machinery of the National Railways of Mexico, succeeding Aquiles Amparan, who has resigned.

S. E. MUELLER, superintendent of shops of the Chicago, Rock Island & Pacific at Silvis, Ill., has been appointed superintendent of motive power, second mechanical district, with headquarters at Kansas City, Mo., to succeed J. M. Kerwin.

WALTER ALEXANDER, master mechanic on the Canadian National at Winnipeg, Man., has been promoted to superintendent of motive power and car equipment of the Alberta district with headquarters at Edmonton, Alta., succeeding W. Walker.

W. WALKER, superintendent of motive power and car equipment of the Canadian National at Edmonton, Alta., has been transferred to the Manitoba district, with headquarters at Winnipeg, Man., succeeding H. A. English, retired.

A. R. RUITER, master mechanic on the Chicago, Rock Island & Pacific at Kansas City, Kan., has been appointed assistant chief operating officer, mechanical, a newly created position, with headquarters at Chicago.

C. S. PERRY, master mechanic of the Atlanta, Birmingham & Coast at Fitzgerald, Ga., has been appointed superintendent motive power, with headquarters at Atlanta, Ga., succeeding A. W. Kirkland.

A. W. KIRKLAND, superintendent motive power of the Atlanta, Birmingham & Coast at Atlanta, Ga., has retired.

Master Mechanics and Road Foremen

S. E. FULKS has been appointed road foreman of engines, Handley coal subdivision, of the Chesapeake & Ohio, with headquarters at Handley, W. Va.

M. K. ROBB has been appointed master mechanic of the Canadian National at Prince Albert, Sask., relieving P. J. Sproule.

P. J. SPROULE, master mechanic of the Canadian National at Prince Albert, Sask., has been transferred to Sioux Lookout, Ont., to succeed C. D. Smith.

G. W. HEYMAN, master mechanic of the Chicago, Rock Island & Pacific at Cedar Rapids, Iowa, has been transferred to Kansas City, Kan., replacing A. R. Ruiter.

A. W. BYRON, master mechanic of the Philadelphia Terminal division of the Pennsylvania, has been appointed master mechanic of the Philadelphia Terminal, Atlantic divisions, and the Pennsylvania-Reading Seashore Lines.

H. C. MCCULLOUGH, road foreman of equipment of the Chicago, Rock Island & Pacific at Kansas City, Mo., has been promoted to master mechanic at Cedar Rapids, Iowa, relieving G. W. Heyman.

J. M. KERWIN, superintendent of motive power second district of the Chicago, Rock Island & Pacific at Kansas City, Mo., has been appointed master mechanic at Shawnee, Okla., replacing L. D. Richards.

C. D. SMITH, master mechanic of the Port Arthur division of the Canadian National at Sioux Lookout, Ont., has been transferred to Winnipeg, Man., succeeding W. Alexander.

FRANK K. MOSES, master mechanic of the Baltimore & Ohio Chicago Terminal at Chicago, has retired. Mr. Moses entered the service of the B. & O. in May, 1889, as an engine wiper, at Garrett, Ind. In February, 1890, he became a machinist apprentice, and in February, 1894, machinist. He left the B. & O. in April, 1902, to enter business, returning to the B. & O. as a machinist in October, 1905. In October, 1907, he was promoted to the position of enginehouse foreman. He entered the service of the Clover Leaf Railroad in October, 1908, but again returned to the B. & O. in November, 1910, as drop-pit foreman. He was reappointed enginehouse

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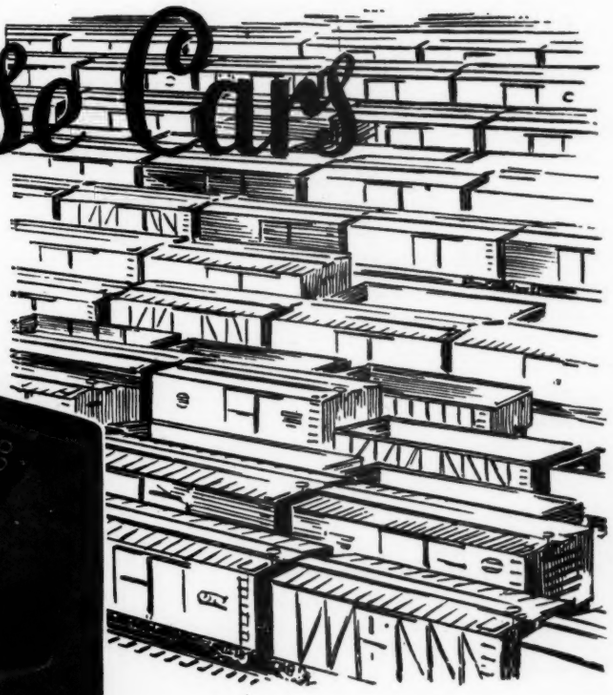

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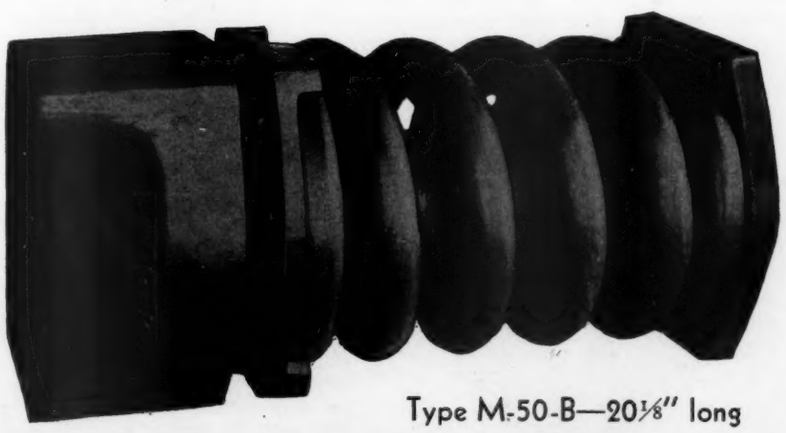

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General Offices: CLEVELAND, OHIO

Sales Offices: New York, Philadelphia, Chicago, St. Louis, San Francisco.
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foreman in December, 1910, and in June, 1913, became general foreman. He was transferred to the B. & O. C. T. as master mechanic in December, 1914.

J. L. MARKS, assistant master mechanic of the Middle division of the Pennsylvania, has been appointed assistant master mechanic of the Philadelphia division, with headquarters at Harrisburg, Pa.

Car Department

W. E. SCRAGG has been appointed division general car foreman of the Boston & Maine, with headquarters at East Deerfield, Mass.

C. ANGUS, car foreman of the Temiskaming & Northern Ontario, with headquarters at Timmins, Ont., has been appointed general car foreman, with jurisdiction over car department matters, with headquarters at North Bay.

Shop and Enginehouse

L. D. RICHARDS, master mechanic of the Chicago, Rock Island & Pacific at Shawnee, Okla., has been appointed superintendent of shops at Silvis, Ill., replacing S. E. Mueller.

Purchasing and Stores

GEORGE A. STINCHFIELD has been appointed acting storekeeper of the Maine Central and the Portland Terminal, with headquarters at Waterville, Me., succeeding H. P. Richardson, deceased.

C. S. PALSGROVE, district storekeeper of the Chicago & North Western, with headquarters at Clinton, Iowa, has been transferred to Boone, Iowa, with the same jurisdiction as formerly.

THOMAS P. HARRIS, assistant purchasing agent of the Canadian National at Montreal, has been appointed purchasing agent of the Grand Trunk Western at Detroit, Mich., to succeed W. E. Evans. Mr. Harris was born in Bristol, England, on

T. P. Harris

October 26, 1896, and entered the service of the Grand Trunk in July, 1911. He left in February, 1915, to enlist in the Canadian Expeditionary Force and on demobilization in May, 1919, returned to the purchasing department.

Obituary

M. A. KINNEY, general master mechanic of the Chesapeake & Ohio, with headquarters at Columbus, Ohio, died on July 16.

HAROLD P. RICHARDSON, storekeeper of the Maine Central, with headquarters at Waterville, Me., died on June 30, at Elm City Hospital, Waterville, following a short illness.

M. R. FEELEY, master mechanic of the Delaware, Lackawanna & Western at Scranton, Pa., died on July 19. Mr. Feeley entered railroad service with the Lackawanna in 1904 as a machinist apprentice at the Kingsland, N. J. shops. He completed his apprenticeship in 1908, and was appointed assistant foreman shortly afterward. In March, 1912, he was appointed engine foreman at Secaucus, N. J., and in the following December became general foreman at Kingsland shops. Mr. Feeley was advanced to general enginehouse foreman at Hoboken in December, 1916, and seven years later was appointed master mechanic at Scranton.

WILLIAM HALL, formerly general machine shop foreman of the Chicago & Northern and for many years secretary-treasurer of the International Railway General Foremen's Association, passed

William Hall

away at his home in Winona, Minn., June 20, at the age of 81 years. Mr. Hall was born July 12, 1856, in Bromsgrove, England, and came to the United States in 1880. He had been an employee of the Chicago & North Western for 42 years, retiring from active service in 1922. He served as general machine shop foreman at Escanaba, Mich., in 1912, and as erecting shop foreman at Winona, Minn., from 1914 until the date of his retirement.

Mr. Hall was one of the organizers and a charter member of the International Railway General Foremen's Association and served as secretary-treasurer from 1906 to 1937, or almost during the entire existence of the association. He was interested in school affairs and served as a member of the Winona Board of Education for 12 years, being president of the board for three terms.

Trade Publications

Copies of trade publications described in the column can be obtained by writing to the manufacturers. State the name and number of the bulletin or catalog desired, when mentioned in the description.

COUNTERBORING TOOLS.—National Twist Drill & Tool Company, Detroit, Mich. 15-page illustrated bulletin. Heavy-duty counterboring tools with patented spline-taper drive.

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SAFETY DEVICES.—Willson Products, Inc., Reading, Pa. Catalog illustrates and describes Willson line of eye, nose, throat and lung protectors—goggles, welding handshields and helmets, respirators, etc.

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METAL BENDINGS.—Wallace Supplies Mfg. Co., 1310-12 Diversey Parkway, Chicago. Bulletin No. 29. Describes hydraulic, motor-driven and hand-operated bending machines.

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TRACTORS; TRUCKS.—Baker Industrial Truck Division of The Baker-Raulang Co., 2168 West Twenty-fifth street, Cleveland, Ohio. General Catalog No. 50; 18 pages, illustrated. General specifications for elevating trucks, Hy-lift trucks, fork trucks, tractors, cranes, etc.

◆

VALVES.—Gold Car Heating & Lighting Co., 220-36th street, Brooklyn, N. Y., Bulletin No. 10; 8 pages. Introduces new pressure reducing and regulating valves, starting valves, and end train pipe valves in the larger sizes for railway, marine and industrial service.

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GLOBE AND ANGLE VALVES.—Crane Co., 836 South Michigan avenue, Chicago. "The Inside Story of Crane Plug Disc, Globe and Angle Valves," for throttling, blow-off, boiler feed, or other service where valves are operated in any but a full open or closed position.

◆

"HOW TO RUN A LATHE".—South Bend Lathe Works, South Bend, Ind., 34th edition; 128 pages. Price, 25 cents. Material divided into chapters and subheadings according to machining operations, beginning with the elementary work and progressing to the more advanced metal-working jobs. Illustrates lathe set-ups and methods for handling important machining operations. General shop information.

◆

KOPPERS YEARBOOK, 1938.—Koppers Company, Pittsburgh, Pa. Contains corporation chart and property map and tells for the first time the story of the Koppers Company. Describes how the balance sheet and profit and loss statement of one large American corporation would look if employees had divided the business and each had operated as a one-man concern, and the position of the Koppers Company as a shipper.